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IN ALL THEIR DEPARTMENTS.

BY A COMMITTEE OF PRACTICAL SURVEYORS, ENGINEERS, AND ARCHITECTS, OF MUCH EXPERIENCE AND IN ACTIVE EMPLOYMENT.

ROBERT MUDIE, LITERARY CONDUCTOR.

ELEMENTARY LESSONS

IN THE THREE PROFESSIONS, OR ANY OF THEM.

NO. II.—NUMBERS.

PERMIT US again to request our readers to bear in mind that these lessons are intended for mere beginners, and their object is to enable the student, for himself, to overcome certain little difficulties, against which he may not be prepared either at school or in the office. For this reason the first ones will be very simple, and we shall give them as little of the dictatorial form as possible.

NUMBER, or Arithmetic—that is the arranging of numbers so that we may be able to apply them to useful purposes, is the first intellectual subject usually presented to the young student; and it is very properly so, because number, in itself, is the simplest of all our intellectual comprehensions.

Every boy, above the very lowest of those educated for charity, learns, or more strictly speaking, “does,” at school, what is called arithmetic or cyphering—and if 0 and cypher be synonymous expressions, we believe the latter name is as appropriate as a name can well be. The boys are made to perform certain operations, according to rules which are not explained, and they are taught to believe that the results are numbers, answering the conditions of the cases before them. This goes on as far as the time of the boy will admit, or till he has some notion of the routine of doing whatever requires to be done by calculation, in a shop, a warehouse, a counting-house, or a bank. But of the nature of numbers he knows nothing more than if they were the mere counters of a Chinese swanpan.

In the mercantile world this is all very well; but it will not do for a Surveyor, an Engineer, or an Architect. Numbers present themselves to these, and that in the most simple cases, in relations with which the expertest merely mercantile accountant would not know how to deal. The following is, for instance, a case of great apparent simplicity, and yet there lurks under it one of those little puzzles:—A plot of ground is a square, and each of its four sides is exactly a chain long; what is the length of its diagonal, or line drawn across the centre of it from one angle to the opposite one?

The boy, who in all probability has acquired some knowledge of the simpler elements of geometry, or of their results, may remember that if the squares of two contiguous sides of a square or rectangle be added together, the square root of their sum will be the length of the diagonal. Each of the contiguous sides in our example is 1 chain; and consequently the square of each of them 1 square chain. Put them together, and it is obvious that the diagonal required is the side of a square containing 2 square chains of surface; in other words, it is the square root of the number 2, considered as square chains; and had the measure been anything different, the relation would have been still the same. Now the question is, What is the square root of 2, and how are we to express it? It is greater than 1, for 1 is the square root of 1; and less than 2, for 2

is the square root of 4. It is therefore some number intermediate between 1 and 2, or 1 with some fraction; and the inquiry is, whether this fraction can be expressed in the same manner as ordinary arithmetical fractions.

A very little consideration will show the student that it cannot be an ordinary fraction, expressible by an arithmetical numerator and denominator consisting of any definite number of figures, however few, or however many. For, if we take any arithmetical whole number and fraction whatsoever, and consider the two as one whole, expressing the entire value of a single quantity or magnitude, then the square cannot be a whole number. This of course arises from the nature of the mixed number, or number made up of a whole number and a fraction; for, to find the square of it, we must multiply it by itself, according to the ordinary process of multiplication. This product, when analysed, will be found to consist of the four parts following:—First, the square of the whole number; secondly, the whole number in the first multiplied by the fraction in the second; thirdly, the whole number in the second multiplied by the fraction in the first; and fourthly, the square of the fraction. Now, the square of the fraction cannot become a whole number in the process of adding, for there is nothing to add to it; therefore, in every case, the square of a number containing a fraction must contain a fraction; and conversely, if the square root of a whole number is not exactly expressible by another whole number, it cannot exactly be expressed by a whole number and any fraction whatsoever.

This, though a very simple case, is a puzzling one to a boy who wishes to understand what he is doing, and yet knows nothing about the properties of numbers, or of the law according to which we express them by means of arithmetical figures.

Very rude nations follow what is called the order of nature,—have a separate name or expression for each single number; and so vague and awkward is this mode of expression, that historians have noticed some nations, a little advanced in civilization, who yet could not count beyond the number 3. But our arrangement—or scale of numbers as we with propriety term it, enables us to express numbers so vast as to exceed all comprehension, by means of a very few characters and not many names; and also to bring into expression by means of the same scale, and know, the relative values of numbers so much smaller than the number 1, that we can have no clear conception of them in any other way than by means of the scale of numbers. The fact is, that this apparently simple and everyday matter of the scale of numbers, is one of the most magnificent and most useful inventions of the human mind, and it has done more for the advancement of science, especially the engineering sciences, than any thing else we could name. By means of it a man can do in a few minutes, that which without it he could not have accomplished in his whole lifetime; and on this account, as well as on account of its being as useful now as ever it was, everybody who wishes to understand anything of measuring and calcula-

ting for scientific purposes ought to be thoroughly acquainted with it.

Its simplicity is equal to its beauty and usefulness. Some number is taken, and all other numbers are expressed in terms of this one, at the same time that each has another and independent value. Any number might have been used for this purpose, but *ten* has been adopted, and much inconvenience, but no advantage, would result from changing it. The numbers below ten, as everybody knows, whether they know anything about the scale or not, are expressed by nine characters—1, 2, 3, 4, 5, 6, 7, 8, 9; and this original value, or *value of form* as it may be called, remains unchanged under all circumstances. All these express as many times the number 1 as is denoted by their names. Where we come to 10, however, we immediately have recourse to the scale, and tens are expressed by putting 0 on the right hand of the proper number of ones, or units. Thus, 5 means five, or five ones; 50 means five times ten, or fifty, and so in other cases. One single instance is sufficient to illustrate the nature of the scale, because it is the same in all its parts, however extensive it may be. We shall therefore give a portion of the scale itself, in order to see the relations:

Integers, or whole numbers.	Decimals, or fractions.
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This expression might be extended to any number of places whatsoever; but this example, which expresses hundred thousand millions in the left hand place, and billionth parts in the right hand place, is greatly more extensive than ever is needed in practice. The example expresses the places only, without any reference to value, for all the places are occupied by 0s. If, however, any of the nine figures were substituted in place of one of the 0's, it would have its double value, namely, the constant value depending on its form, and its variable value as *depending on its place*. The least valuable end of the scale is that toward your right hand; and, supposing the same figure to be brought up through all the places from your right hand to your left, its value would become ten times greater by every removal. In like manner, if any figure were moved from your left to your right, it would become ten times less by every removal.

Of the two values which every figure in a line consisting of several figures is possessed, the one is therefore the result of the addition of as many 1s as the number expresses; and the other is made up of successive multiplications by 10, as many times as the figure has places from the right hand of the integral part of the number to which it belongs:—thus, the invariable value of 5 is the sum of five 1s; but if this 5 so stands in the scale as to express five hundred, it is a product of 5, multiplied twice successively by 10, and would be five hundred if it stood with two 0s after it.

This double value, or value of the figure, and value of its place, gives us a wonderful power over numbers; so that, by means of our nine figures, and the 0 to supply blanks, we are enabled to express more numbers than the inhabitants of all the world could count in a thousand millions of years—in any number of years whatsoever. This is an abridgment of time and labour which sets all our steam powers, steam ships, steam carriages, and other contrivances for obtaining speed, in the most insignificant point of view; and be it remembered, that if we had not first been in possession of this, we should never have made the slightest approach towards any of the others.

We cannot increase the value of any individual figure but by adding to it; and we cannot add until the sum exceed 9 without

driving some part of the figure a place to the left, or higher up in the scale; neither can we diminish this value but by taking away 1s; and if the 1s so taken away amount to more than 9, if any part of the figure remains, it will be driven a place to your right, or lower in the scale. If, on the other hand, we wish to change the value of place, we make the figure ten times greater or ten times less, according as it is moved to your left or your right. These double values of the figures in a number consisting of more than one figure, are very simple matters, and apt to be neglected by school-boys; but in one who has to make nice calculations, this is sure to be felt afterwards as a serious want, and one that is then not easily supplied.

The values of form, in figures in the same places, make them all quantities of the same kind, which can be added or subtracted; and the sum or difference is of the same kind with the particulars. But figures which occupy different places of the scale, in the same number, or in different numbers, are of different kinds, and can neither be added nor subtracted so that the result shall have a meaning, unless by some means they can be brought to exactly the same place in the scale.

On looking back to the skeleton scale, all made up of 0's, which we have given, the student will perceive that we have divided it into two parts by a point ('); and that we have named the portion to our left of the point, the scale of integers or whole numbers, and the portion to the right of the same, the scale of fractions or decimals. The two scales however are in principle one and the same; so that if any figure were made to travel from the highest place of the integers to the lowest place of the decimals, it would be reduced to one tenth of its value at each step of the whole scale; and if it were made to travel from the lowest decimal to the highest integer, it would become ten times greater at every step of the scale. The distinction between an integral and a decimal scale is not, therefore, founded upon any difference in the scales themselves, but upon the kinds of numbers applicable to each;—no number less than 1 being expressible by the integral scale, and no number so great as 1 by the decimal scale. 1 and all whole numbers adapt themselves immediately to the scale, because it is according to it that they are formed; and the value of any one figure in an integral number can be seen at once, by simply counting how far it is from the point which distinguishes the integers from the decimals. It is the figure itself multiplied as often by 10 as this number of places; and as multiplying by 10 and annexing 0 are the same thing, we have only to annex the requisite number of 0's. Thus, if any number, 7, stand three places from the decimal point, the value of this 7, without any reference to the other figures which may be along with it, will be 7 multiplied three times by 10, that is, 7000, or seven thousand.

Numbers which require to be placed in the decimal part of the scale are not naturally adapted to it; and therefore some preparation is necessary for this purpose. In arithmetic these numbers are the quotients that would be obtained by dividing smaller numbers by larger ones; and in no such case can the quotient be so great as 1; therefore it cannot be expressed by any whole or integral number. Let the case be the very simple fraction 3 divided by 4, or $\frac{3}{4}$. This is 3 expressed in terms of 4; and in like manner any smaller number which requires to be divided by a larger one, may be expressed in terms of that larger one as denominator. Now it rarely happens that this denominator is 10, or any power of 10, that is 1 with any number of 0s after it. But if it is, the number

to be divided, or numerator as it is called, is already expressed in terms of 10; and the figures can at once be applied to the decimal scale, by taking care that they occupy just as many places in that scale as there are 0s after the 1 in the denominator; and if they do not amount to this number, the deficiency must be supplied by 0s immediately after the decimal point, and before the figures. The cases of this kind that occur are however very few; and therefore, the general problem, to express any number in terms of the number 10, or some power of 10, is one which should be well understood.

We shall best understand the principle of it by taking a practical case: There once was such a coin in this country as a seven-shilling piece; and a certain sum of money which we shall call *a* was expressed or counted in seven-shilling pieces; it is required to express the same in sovereigns. The process here is evidently, multiply *a* by 7, and divide the product by 20; or the number of sovereigns will be seven-twentieths of *a*. Now let us return to our fraction three-fourths, and express it in terms of 10, or some power of 10. It is three-fourths of 10, which is the same as the fourth part of three tens, or 30, which is 7 and there remain 2; annex 0 to this, and we have the fourth part of two tens, which is 5; and as we used two powers of 10, the 75 which we obtained will be 75 divided by 100, or 7 in the first decimal place, and 5 in the second. Generalizing the example, we have the following rule. To express any fraction in terms of the number 10, or in other words, to reduce it to a decimal, annex as many 0s as may be thought necessary to the dividend or numerator; divide by the divisor or denominator; the quotient will be the decimal required, and it must consist of as many places as there are 0s annexed to the numerator or dividend. If the quotient figures do not equal this number, as many 0s must be placed between them and the decimal point as make up the difference. The great advantage of this method of bringing fractions as well as whole numbers into the scale, consists in the perfect uniformity which it gives to all the operations of arithmetic; and if accountants, of whatever denomination, were wise, they would never have recourse to any other method.

Then, however, there arises this question: Can all fractional numbers, or numbers whose values are less than one, be expressed in terms of the number 10? The answer to this question is in the negative, in a very great majority of cases. Irrational numbers, such as the square roots of all whole numbers which cannot be obtained in whole numbers (we had the square root of 2 as an instance), and the square roots of all fractions which cannot be obtained in simpler terms, that is, in fractions with smaller denominations than the ones whose roots are sought, are not expressible in terms of any known number whatsoever, and consequently not in terms of the number 10.

Besides these, by far the greater number of rational fractions whose values are perfectly well known and easily expressed fractionally, cannot be wholly expressed in decimals. In all cases, however, so near approximations to the truth can be made that they are quite sufficient for every useful purpose; and there are many little methods whereby fractions can be expressed decimally, and the reverse, with very little trouble. But as the understanding of these subjects requires a knowledge of the composition of numbers, it will be better deferred to another lesson.

LONDON IMPROVEMENTS.

THROUGH what description of cranial aperture it may have broken, we shall not take time to inquire, but certain it is, that a beam of the genuine light of improvement has broken in on the Common Council of London, and we sincerely hope, and would gladly believe, that this will soon illuminate the whole of the metropolitan civic authorities, and extend from thence to our other cities and larger towns.

In this, we recognize a species of improvement which is wholly civic—belongs to the people themselves, and has no immediate connection with public men or public purposes. For these latter, we have said again and again, that liberal or popular governments are by no means so well adapted as those of a more despotic character, in which the direction of all public matters centres more immediately in the ruling individual. In stating this, we spoke merely *quâ* public works, and expressed no political opinion whatsoever; and we think that any one, who carefully examines either the progressive history or the present state of the world, will be brought to exactly the same conclusion as we have been. No matter what the nation was, or how high its name stood on the general record for liberty; it will be found, that all the very great public works, of which we have the remains, were planned and executed at times when the governments of the states were despotisms *de facto*, whatever they may have been nominally.

A liberal government, and more especially one mixed up with a complicated representation, like that of Britain, is a cumbrous and heavy machine; and cannot be started into action or work to any valuable purpose, without a great deal of labour and expense. Hence, such a machine comes into action for improvements, under its own immediate patronage and direction, as seldom as possible; and many of the results in this country show, in taste, in adaptation to the purposes, and in cost as compared with the real value, that the less frequently this clumsy engine comes into exercise, the better.

Let us take a few instances: as one instance, take the British Museum, which has long been noted for the neglect, gradual and final destruction, of some of the choice sections in the natural history department. Is that building worthy of its contents, or of such a nation as Britain? No man of sense dare answer in the affirmative. When our rulers bestirred themselves to gratify an amiable and beloved prince, in finding him a fit domicile for his favourite puppies, did they go for a model to the British Museum, that grand receptacle of the remains and exuvie of beasts and birds and creeping things, together with all that is marvellous or monstrous in the wide kingdom of Nature?

Not a jot! Reasoning, no doubt, upon the adage of the wise man, that, "a living dog is better than a dead lion," they thought the Museum too tame and commonplace for being the model of a princely dog-kennel; and, therefore, they sought their pattern in the genius of some one well skilled in the affinities between architecture and dogs. If the building had been for any other purpose, the conduct would have been quite analogous.

If we take more modern instances of what may be called official or government improvement, which, within the metropolis, is, of course, chiefly, if not wholly, confined to buildings for public purposes, the case turns out to be every where the same. That the buildings are substantial pieces of work, and that they answer very well for the purposes to which they are applied, we have no reason

or disposition to doubt. But when we come to the question of ornament, the case is wofully different; for the structures are neither ornamental in themselves, nor do they ornament the situations in which they are placed. The new portion—that is, the newly built portion—of the Treasury, shows that it is costly enough; but it is a wretchedly dwarfed thing, and absolutely makes the place look more miserable than before the alteration was made. Sir Matthew White Ridley's comparison of the first portion to a stage on a race course, was a happy one; and it will retain its force and truth after the whole pile is modernized, unless what has been erected shall be pulled down, and a style having some dignity and grandeur introduced, in place of the fluted poles and worm-eaten cabbages, which have an appearance so mean and pitiful.

The only other instance which we shall adduce, and we merely notice it, is the thing upon the north side of Trafalgar Square, sometimes called "the National Gallery," and sometimes "the National Pepper-boxes;" for an idea of something like the facade of what a National Gallery ought to be, the reader will have the kindness to look at the elevation of one of the fronts of the Berlin Museum, which we give in this number; but we must beg of him to remember, that much of the real glory of the Berlin Museum is within; and, therefore, we must give the ground plan, and view the two in relation, before we can have a proper feeling of that most majestic, yet most unique and natural idea, which the genius of the architect has there embodied. Our poor little gallery is a very emblem of meanness and insignificance; and one would think that the combined heaviness of all the bathotic sinkers in architecture had been conglomerated to produce that lowly effect, which is here so conspicuous. "It might do for a dog kennel," observed William the Fourth, upon first viewing it; but after all we are not positive that it has been copied in the kennel for Prince Albert's puppies.—But enough of these matters. We merely introduce them to show that the air of Britain, that is, the whole system of British government and society, is unfavourable to any high effort of genius in this particular department of Architecture.

When, however, we turn to what we have called civic improvement—that is, improvement for the many, without any reference to rulers or other men of power, we soon perceive that Britain is the very country for it, and London the grand centre from which it should be propagated over that country. Such being the case, it follows of necessary consequence that the grand improvement of London ought to be something central,—something which the congregated multitudes of the British provinces, as well as foreigners from all parts of the world, may see and admire on their immediate arrival.

Now, the question is, which is the central point of resort to the mighty mass of London? Sir Christopher appears to have been of opinion that this point is the Royal Exchange; and, therefore, he proposed that all the principal streets which required total rebuilding, and indeed re-laying-out, should converge upon it. What may have been the claims of the Royal Exchange to this superiority in the days of Sir Christopher, we have no means of ascertaining; and certainly, while the General Post Office remained in the near vicinity of the Exchange, it conduced to the centralism of the spot. But, in the present state of the country and the world, the Royal Exchange has ceased to be the centre of London in any legitimate sense of the word. We are far from wishing to decry the attractions or the value of the Royal Exchange, but still we must state the truth: the Exchange is not a centre of general attraction

for people of all classes, at any one time of the day. In the mornings it is visited by stock-brokers and loungers; and now that Rothschild and his pillar are both lost to the world, we think it possible that the resort of dealers in funds and shares, speculators in the money market as they may be termed, are not likely to crowd so much to the Exchange as they did in former times. But even though they were more numerous than they were in former times, this would not give to the Exchange that centralism which is required.

Where then shall we look for the centre? The answer is as clear as possibly can be,—to the vicinity of the *General Post Office*. This is the grand centre of communication, from which the knowledge of Britain is disseminated over every land, and to which the knowledge of all lands is conveyed to Britain. If, therefore, there is centralization in the world, this is its grand focus; and it is not the mere centralizing of a system of opinions, or a set of people, which obtains here,—it is the centralization of mind, and what mind elaborates, in that, and for all the countries upon earth. Now it is pleasing to remark, that this is the very locality selected by the Common Council of London for the improvement which has been mooted by them. It is true that their improvement is only a little one: the obtaining free space, fresh air, and an extended view, in a situation where all the three are desirable. They purpose to cut off both sides of Paternoster Row as far as Panyer's Alley, which is nearly in a line with St. Martin's le Grand, and thus get an open space all the way, from beyond the Bull and Mouth on the north, to the south side of St. Paul's church yard. By this means a view of St. Paul's will be had; and though it is not the best possible one that could be devised, it would be superior to any now existing.

Of improvements beyond this, we have heard nothing from the same quarter; and, therefore, we may safely conclude that those by whom it was broached, did not think of the great civic improvement which we are about to notice, and merely notice.

Still, however, let the proposed opening be made, and the view of St. Paul's obtained; and people of intelligence will soon see something more,—will see that St. Paul's church yard is susceptible of being made the most splendid bazaar in Europe. What requires to be done is to clear away the whole of the present buildings, to Paternoster Row on the north; to Ave Maria and Creed Lanes on the west; to Carter Lane on the south; and to Old Change on the east; and an area of about 900 feet by 500 feet is at once obtained, in the centre of which rises the stately pile of St. Paul's. There is no doubt that the proprietors of the houses to be taken down would make every possible resistance, and try to enhance the value of their property by every means in their power. We are pretty certain, however, that even this vast expense might be, in great part, provided for without the sinking of very much money. The quadrangle, so extended, would be the most magnificent place in London for first-class retail shops; and as there is, and has been for some time, a strong tendency on the part both of shopkeepers and customers to move in this direction, there is no doubt that all the sides of the square would be occupied by shops of such appearance and character, that of themselves they would go far to meet the present rental of the three lines of shops and warehouses, which would require to be removed in order to carry the plan into effect. The only buildings against the removal of which a furious resistance might be made, independently of all pecuniary considerations, are the Chapter-house and St. Paul's school. The first of these is just as ugly

as a building can well be, and does small credit to a dean and chapter so well endowed as they of St. Paul's; and the second, though gorgeous and expensive in its architecture, is destitute of beauty, and badly placed. The play ground, or rather play cellar, for the boys, under the rest of the building, where they are shown in cages like Bajazets, is about as ludicrous an absurdity as can well be supposed, and travellers from foreign parts who have not been informed of the real facts of the case, must be astonished when they see so many young culprits in durance vile, close by the metropolitan cathedral, and all so happy under the infliction of their punishment.

To some, this improvement may seem impracticable; but more has been effected in other parts of the metropolis without producing results half so beautiful or half so valuable as this could be made. A chapter house might easily be provided within the quadrangle, if the palisaded ground were brought into decent shape, and the unseemly tombs which are exposed to the open day were entirely removed. To inter bodies in the vaults under St. Paul's, situated as it is in the very heart of the city, is bad enough; but to have crumbling monuments around, which show the corrosive nature of the gases arising from the ground, is really too bad; and ought to have been put an end to long ago by the dean and chapter themselves.

The palisaded part of the quadrangle, or that immediately surrounding the cathedral, should be laid out with good taste, and planted with appropriate shrubs and flowers,—among which, the spiry cypress would be a far finer emblem of immortality than half-decayed cherubs upon tombs shaped like great trunks.

There are many reasons why shrubs should, and would, grow more kindly in this area immediately around St. Paul's, than they would do in any other spot within the precincts of the city. The ground is higher than for a great distance round; the subsoil is a kindly gravel; the winds of heaven, which even now sport about St. Paul's if any where in London, would pass freely over them; the least shower would wash them, and even without much human care they would be as favourably situated as in most suburban gardens, and more so perhaps than in any square at the West-end, where, though there may be more merely open space, there is not so much ventilation. This is only a trifling item of the whole improvement; but it might be rendered a very pleasing one; and if the dean and chapter could be prevailed upon to move the time stains from the masonry, and repair those little portions where the destroyer has been trying his tooth upon the materials, St. Paul's might be made, and continue to be, a credit to the dean and chapter, and an ornament to the city. As the case stands, it reflects credit on nobody but Sir Christopher Wren, and along with the credit there comes the painful sting, that it is totally disregarded, except in so far as collecting fees for seeing the great bell, and "other sights to be let," about which, one who can duly appreciate such a building as the cathedral, notwithstanding its faults,—and it is by no means faultless,—cares not a single rush.

Even the fence, which at present frowns bristling like palisades upon some fortification, might be made matter of ornament. Much in the way of beauty has lately been done in bronze, or bronzed iron, and more yet remains to be accomplished—improvement in this way having no limit but the encouragement it meets with. By means of this material, this might be made an ornamental work even in summer; and if lamps were placed upon it in sufficient number and in judicious situations, it might be made a most brilliant thing in the winter.

Then, exterior of this, ample carriage-ways might be laid down in wood, in the most approved manner; so that the carriages might pass and repass without making hardly any noise. Between the carriage-way and the shops there might be a spacious and commodious foot-pavement, laid in asphalt, which would be one of the best and most attractive promenades in the metropolis, the more so on account of the great line of shops, containing the most fashionable and costly goods, and also of the ample and safe room that there may be for every carriage to draw up to, or on, the foot-pavement, without the slightest jarring or confusion.

Such a place would be a public ornament on the most extensive scale, of the most magnificent appearance, and still perfectly in the civic character. We have been taunted with being a nation of shopkeepers; but were this improvement carried into effect, we should be able to show that a place of shops and shop-keepers could be rendered more brilliant, more attractive, and incalculably more useful, than all the places where military trophies and the other emblems of war are displayed as the subjects most worthy of being seen and admired; nor would it be long, ere the very owners of these things themselves, when they heard praises bestowed upon their colossal bronze, and their allegorical lead, would say to the admiring stranger, "Wait till you have seen what effect the English can produce by means of their shops,"—the influence of which, in a moral point of view, would be highly important.

There is one other improvement, not immediately connected with this, but bearing a close relation to it, which is also worthy of mature consideration. The railways, which are now the grand thoroughfares both to and from the metropolis, have managed the distribution of their termini just as badly as they have done everything else. These are scattered about the outskirts of London, some of them many miles from the centre of it; and the second journey of the traveller from the railway to his destination in town is often more troublesome to him than his journey along the line. This ought to be remedied; and the only effectual remedy would be to bring the termini close to each other, and as near to the General Post-office as possible. But how this is to be accomplished must be left for future consideration.

SALISBURY FLOODS.

TO THE EDITOR, &c.

ON examining the banks of the Avon from Christchurch to Salisbury, those of the Willey from that city to Wilton, and the numerous little valleys the streams of which converge upon the city, I have again and again thought of what has been expressed in the "Surveyor, Engineer, and Architect," respecting the neglect of the outfalls and lower valleys of rivers, more especially those of our southern counties. I can easily perceive that much of what has been of the most kindly sward in the valley between Christchurch and Wilton has now become a mossy soil, covered with rank vegetation and giving out unwholesome exhalations, even in the summer months, in those very places where one would expect the air to be most balmy and delightful. In traversing the slopes where the plain comes down to those rivers, you have also set me a thinking why there should not be water on those pleasant surfaces. It is true the soil, like that of all continuous chalk downs, is not adapted for natural springs; and therefore it would be in vain to look for them. But still, the country between Salisbury plain and

the perennial feeders of the Avon and the Willey, has its surface so beautifully formed as a land of banks and streams, that there is a difficulty in supposing that it had not at one time rivulets meandering over great part of its surface; though now there is not, in summer, a trace of a water-course, far less of water, for many miles distance; and the few inhabitants who live, or rather suffer living existence, upon the upper part of the plain, have to quench their thirst from stagnant pools of the colour of brass. The consequence is, that fertility has gone with the means of its support; and the wide extent of Salisbury plain is now of less annual value to the nation than even a small farm in those midland counties where the skill and industry of man have seconded, preserved, and even extended the bounties of Heaven.

When we look abroad, we can perceive no natural change for the worse, or indeed any whatsoever, that has taken place in these southern counties—once the garden and the boast of England. It is well known that Wilts and the proximate counties were those which sent such abundant supplies of grain to the Roman markets on the Continent; and that it was these very downs that produced the wool, the thread spun and cloth woven from which, were in such high estimation by the rulers of the world. Spirits of our fathers! have you left us no intellectual legacy; and while ye were the boast of your country, and the boast of other nations, are we to remain tame and passive, until we shall be kneaded in the clods in the course of physical events.

I need not tell you that the rain of Heaven and the beams of the sun are the grand stimuli which make the earth bring forth its produce; and that under favourable circumstances,—natural circumstances I may say, the frost and snow conduce to the same beneficent purpose. Upon our uplands, these bounties are in a great measure bestowed in vain; and that they are so bestowed we have the consolation, such as it is, of attributing to our own neglect. The whole surface of the plain, and it is by no means a stinted one, is of such geological structure that it resists both the solar heat and the genial shower. When the sun shines out in cloudless majesty, the air immediately over it is intensely hot, while that over fertile lands of the same exposure and elevation is cool and temperate. This hot air drains every particle of moisture from the soil, and carries it up into the atmosphere; so that the parching of Salisbury plain during the summer months resembles that of the African Karoos during the dry monsoons.

Then again, when the rain does come, it does not enter into, and divide and ameliorate the soil, so as to render it favourable to the under-growth of plants, and their consequent health and vigour above ground. It comes upon the surface like a scourge, and lashes and wears that without doing the smallest good to anything that is below. If the shower is temporary, the water is evaporated and wafted off to other places in a few minutes; and if it is of longer continuance, the heights are scourged to a greater extent, and the small particles of chalky matter, which are in a state of almost impalpable powder, but which have no fertility in them, are imbedded in the hollow, and render that more and more waterproof every shower; so that when there appears to be a pool of considerable extent on the surface, that pool has no more influence at the depth of a quarter, or even the eighth of an inch, than if it were not there.

This is the character of all our naked chalk downs, but perhaps Salisbury plain is the most inveterate of the whole. It receives as much sun as most of the others, and perhaps more rain; but

the one beams and the other descends in vain as to any useful purpose.

Such a surface, especially if, like Salisbury plain, its elevation above the level of the sea is considerable, is more prone than any other to receive the very first impressions of the autumnal or winter frosts; and when it becomes frozen, all the humidity of the atmosphere descends in snow, until a current from another district blows long and strongly enough to control the local influence. On most soils, the binding up of the surface with frost is advantageous to the land; because, next to a covering of snow, such binding is the best means of cutting off communication between the earth and the atmosphere; and if the latter continues cold for any length of time, the binding frost prevents the heat of the earth from radiating off to the cold atmosphere over it. In such surfaces and soils as Salisbury plain, there is none of this protective binding; there is no water to freeze, and therefore, if there be any little heat in the ground, it radiates away even before the snow falls; so that the snow, which falls and acts so generally as a protecting mantle in most parts of the country, is effectual upon this unfortunate and devoted surface.

This coldness of the soil has another, and by no means a beneficial effect, when warmer air from another part of the country brings a general thaw. Where there is heat in the soil, that heat softens and partially thaws the lower part of the snow, and the ice, if any under it. So much is this the fact, that, upon a kindly soil, an observer may see the snow decaying faster at the under than at the upper side, and where this is the case, it will be found that the wild flowers come into bloom very soon after the disappearance of the snow; but on a cold and chalky surface, repellent of heat, like that of Salisbury plain, and chalk downs of similar elevation and character, there is nothing that can be considered as ground or self thaw—that is, thaw originating in the locality itself. The whole is accomplished by means of what may be called the foreign winds—that is, the winds from other districts. The consequence is, that the process of thawing goes on from the surface downwards; and if the thawing wind should be withdrawn or suspended for a moment, the surface instantly freezes, and becomes like glass. Indeed, the water, into which the snow, and ice, as it may be, are dissolved, glides over a surface as smooth as glass, and consequently it is perfectly free to obey the action of gravitation, without any friction from the soil over which it flows.

Under such circumstances, those who understand anything about the most common laws and phenomena of hydraulics, must be aware, that even with a very small quantity of water, the consequences may be very serious; and that destructive floods may accumulate in situations where, if the ground laid hold of the water by its friction, not even a stagnant pool would be seen.

Such have often been my reflections during my solitary rambles and shooting excursions, since the remarks in your journal first drew my attention to this department of the field of natural history—a department to which I have very rarely found the slightest attention directed, even among the most intelligent of my associates, and they are not few.

Very likely you may find, for a time at least, the same indifference on the part of the public to other branches of what you have so appropriately termed "Agricultural Engineering;" but you must not mind either this indifference, or the ignorance of which it is the result, but keep the subject before the public; and the course of events will force it upon their attention.

When I thought of it as a mere matter of Engineering speculation, which would lead—as it must invariably lead—to great practical benefit, I little thought of the fearful lesson which we were to have of the neglect of it during the present winter. Fortunately, I was not actually on the scene of the calamity in any one instance, and I will not fatigue you with a mere report of the occurrence, as such reports have been detailed in all newspapers throughout the country—some with greater deviations from the real facts, some with less, as is usual in such cases. Suffice it to say, that property to the amount of fifty thousand pounds, and also several lives, have been lost, and that many poor families have been placed in the very worst state of destitution of which it is possible to form an idea. Our beautiful cathedral laid eight or ten feet under water, and the principal inhabitants of the close excluded from the basement stories of their dwellings, are of themselves considerations which ought to lead those in power and authority to inquire into the causes, and remove them. So far as these go, the causes are, in my opinion, very simple, and the removal would be attended with great and almost immediate profit to the removers themselves. The wild and neglected state in which the mere carelessness of its owners long allowed the Avon below the city to fall, is the real cause of what we may call the quiet inundations, that occur about the cathedral and other low parts of Salisbury below the Avon; and if once the lower river were under the superintendence of one skilful engineer—and one should direct the whole operations—we should have no more of such inundations.

Of the more upland inundations, that take place where the branch rivers from the higher grounds break into the valley, or where the mere hollows, in which there are no summer water-courses, are converted into the beds of flooded rivers, or rather into the temporary beds of travelling lakes, the causes are different, and considerably more difficult to deal with. The water there is not pent up, even by any dam or impediment resulting from human carelessness. It gets too fast away from the surface, and what requires to be done is to keep it there; and if this could be done only for a few hours, there would be comparatively little danger of mischief. Salisbury plain is, however, of so small value per acre, that it would probably be no easy matter to persuade the proprietors to lay out money upon it; and yet, in such a winter as the present, the amount of mischief done, the loss by which must be borne by somebody, would cover the expense of a large sum laid out in the improvement of the surface, and the prevention of such casualties for the future. I sincerely wish that you would turn your attention to this particular subject, and point out how the recurrence of such evils may be prevented, and what are the most likely and effective means of obtaining so desirable a result.

SALISBURIENSIS.

Sarum, February 10, 1841.

[NOTE BY THE CONDUCTOR.—Our correspondent will have the kindness to excuse us. The case of Salisbury cannot be in better hands than his own, intimately as he appears to be acquainted with the circumstances of all the localities. His philosophy is perfectly sound, and does him honor; and we have some pride in holding him up as an example of one well qualified to point out the means of really improving the district he has chosen. We invite others to follow his example, in all the departments of the professions.]

STEAM CARRIAGES ON COMMON ROADS.

TO THE EDITOR, &c.

SIR.—Travelling by steam on the ordinary turnpike roads of the country has been my favourite mode of applying that power as a means of transit, ever since the use of it for locomotion upon land was mooted. The expense of railways is enormous—may be averaged at not less than £35,000 a mile; the expense of maintenance on even the best-made lines, through the most favourable strata, is very great; the transit is subject to accidents for which there appears no remedy, and indeed one can hardly expect it, where such volumes of matter are impelled along with so great velocity; and the railway is for itself and itself only—a perfectly monopolized road, upon which no man can venture but at the certain peril of his life. They are for their termini and their stations only, and not the value of a pin's worth to the country through which they pass. On the contrary, they cut it to pieces, and hurry away from it those travellers whose visits and observations might be of use both to it and to themselves. For certain travellers, and certain conveyances of goods, these railways, if they would reduce their fares to a reasonable amount, might be of service to the country; but theirs is not the general means of intercourse, whereby the country is to be improved. The common roads are the proper lines for this; and though all of them might be improved, and some are very bad, yet in the main they are adapted to the population of the country, or rather, perhaps, in the lapse of years, that population has adapted itself to them. How this matter has been accomplished, is of very little moment, because the adaptation has been made; and if we have not steam carriages on common roads, in my opinion we shall have only the worst, and far the most expensive portion of the steam system, and be entirely without the best.

In an early number of your journal, you brought forward the notion of branch railways striking off from the principal lines, and I was thence apprehensive that you had eaten "o' the insane root" of Railwayism, and become an enemy of that which, for local communication and short journeys, is superior to all the branch railways that can be constructed. It is true that, if I rightly understood your meaning, you intended that these branch railways should be a sort of caterers for the main lines, and thus interfere but little with the local intercourse. But even in this point of view they are not of much value, and perhaps not one in fifty pays for keeping in order, to say nothing about the first cost. Besides this, the steam carriages on the common roads would, in addition to their own more immediate purpose, answer that of catering for the lines of railway, and thus, in every point in which I can place it, the expense of branch railways would be a dead loss. All this would be saved by the steam coach on the common road; and it would have many advantages over the horse coach system. The fact that the railways have thrown most of the coaches out of employment, and caused them to be given up along those lines to which the rails are proximate, is a demonstrative proof that, like the railway trains, the coaches depended chiefly upon long-journey passengers, who went through and through, and afforded but slight local accommodation to the country. They were of considerable advantage in another way, no doubt, for the inn-keepers who supplied horses for the coaches, and refreshment for the travellers, derived no small portion of their revenue from these sources; and they gave employment to artificers of various descriptions. It does not appear, however, that there was much of a vital or extending nature about this kind of support, for it

was confined to the mere towns, and had very little obvious influence upon the country, except to the mere innkeepers and those immediately supported by them. The loss sustained by the putting down of the coaches was thus not so great as many would suppose; and by the introduction of steam power, which, under equal circumstances, is greatly cheaper than horse power, there would be a real saving to the country generally.

Besides this, though a coach well appointed, well horsed, and well driven, is certainly very pretty to look at, there are objections to it which do not apply to steam carriages on railways, and would much less apply to those on common roads. A stage coach with horses is by far the most dangerous of our rapid conveyances over land; and, though a driver of great experience and skill may diminish this danger, as compared with what it is in the hands of an inexperienced bungler, yet no skill and experience can get the better of the whole of it—enough always remains to make the coach with horses a source of danger to the passengers, from which steam carriages are themselves completely free, and of which, in case of the horse coach, no man can tell the time of coming, or the extent. How well soever the horses may be trained and know the hand and the voice of the particular driver, there are sources of fear in these animals which no man can understand. Where one of these comes strongly upon them, or even on one of them, the coach may be overturned in a moment, and the most serious accident may ensue, of which there are numerous recorded instances in the best and most skilfully managed coaches. This danger, which is generally unanticipated, and of course unprovided against, the coach has in addition to all the casualties to which the vehicle and its gear are liable,—such as the breaking of a wheel or an axle, or any other contingency to which every coach is more or less subject, let it be impelled along by what power it may. Besides, there is something insecure in the build and suspending of a horse-coach, which is not to be found in a well-constructed coach to be propelled by steam. The horse coach is liable to be overturned, and the steam coach is not, because of the manner in which the body is suspended. The great security of the steam coach consists, however, in its being altogether a machine, and as such completely under the power of man. No part of it can take alarm and start, and give the conductors that trial of skill, unfortunately but too often baffled, which the driver of the horse coach must hold himself ready to exercise.

Such are a few of the advantages of steam coaches upon common roads; and I ought to know something about the subject, as I have studied it with the utmost care. My attention to it was renewed by the general noise that was recently made about branch railroads, which, if they did not serve as substitutes for the steam carriages, would paralyze the system of these, and incur considerable expense for no apparent purpose but that of doing mischief. It was, therefore, with much pleasure that I saw a new company announced for the establishment of steam carriages upon carriage roads. But this company must be energetic and vigilant, for it has got a powerful opposition to contend with. Every branch railroad will be a little job, parliamentary and otherwise; and therefore, as the company is but one, it will have Legion to contend with in parliamentary jobbers, speculators, and all others who live upon parliamentary jobs, and have no visible means of subsistence without them. These will do what they can to decry the steam coach company, to lessen the value of its shares, and to do it every injury in their power; and if it does not bestir itself, and speedily obtain such funds as will enable it to demonstrate its usefulness by fairly conducted and often repeated

experiments, I fear it must soon go to the wall. Should such unfortunately be the case, it will be the loss of an opportunity which never again can return. The public have a deep interest in it, far more than they have in any railway or work which is fixed to a particular locality. If it fails, they will be the grand sufferers, and therefore it is their duty to see that no parsimony on their part shall destroy that in which they have so deep an interest.

VIATOR.

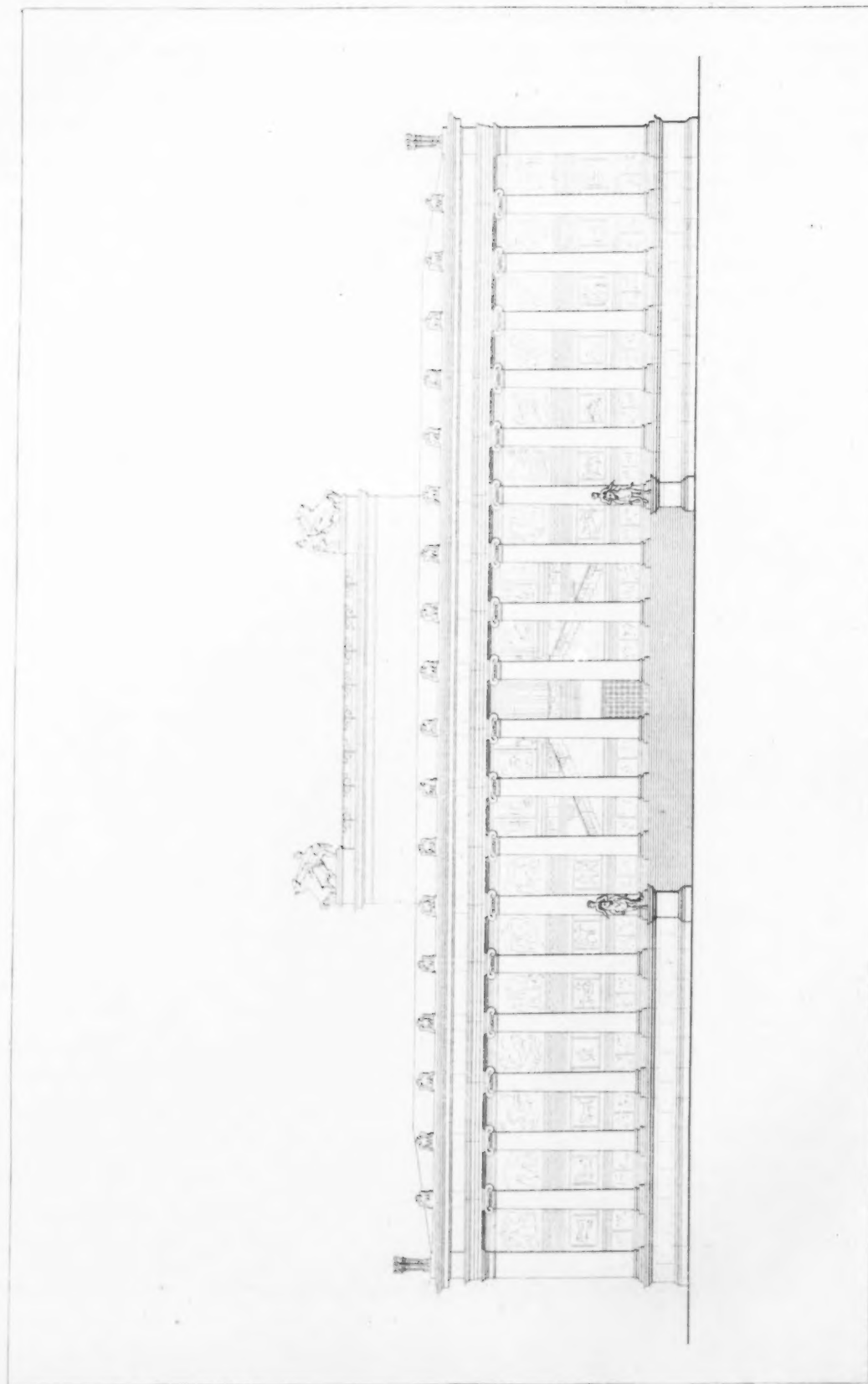
Northampton, February 12, 1841.

THE SOUTHAMPTON DOCKS.

WE always entertained a very high opinion of this project, even before any company was formed, or any certainty appeared that it would be established, or carried into execution. We grounded our favourable opinion upon the physical circumstances of Southampton; which is certainly the finest natural harbour, and, by necessary consequence, the best situation for an artificial one, on all the English shores of the Channel. As the West Channel, by the entrance at the Needles, affords easy access, and admits of free departure in most winds, and as the channel from Spithead is equally available, and the Southampton Water is of ample depth, quite free from rocks and hazards, and not exposed to sudden gusts of wind or heavy swells of the sea, it is perfectly safe when once made; and can be left under circumstances which would prevent the sailing of a vessel from almost any other port in the Channel. For coasters and small craft, the tide and half tide, which flow regularly in this quarter, are very advantageous, because, if a vessel cannot make her port upon the principal high water, she can come so near as to make sure of doing it on the second.

From these circumstances, we have always looked upon Southampton as the proper site for great resort of shipping, especially of vessels to the Peninsula, the Mediterranean, the West Indies, and South America, together indeed with all the intermediate places. It was not difficult to see, that when once there was a fair prospect of a proper harbour, both as receiving harbour and as docks, this port would very soon draw the attention of the shipping interest, especially that of Packet Companies, and others sending out moderately-sized craft, at regular times, and with as little delay as possible. The Proprietors in this work very recently had a general meeting; the statements brought forward at which were highly favourable, both as regards the present state of the work, and its future prospects. It was stated that certain enlargements of the original plan would be necessary; but that, notwithstanding these, the docks would be the cheapest ever constructed. There is an additional advantage: the Itchen river, which joins the Southampton Water immediately eastward of the town, has its estuary or lower channel very deep; and wherever there are interruptions—and they are but slight ones,—in this depth, they are occasioned by silt, which can be very easily raised by the dredging machine, and be of great value in making up the banks of the quays and other artificial grounds, so that the whole bank of the Itchen, as well as the shores of the Southampton water, will be available for wharfage, as well as for the erection of warehouses, and other buildings requisite for the accommodation of a great shipping port. Such are the local advantages, and such the works which the Company have to do; and the facility of doing them, besides the ease with which the ground can be worked, is very considerable. The stone, which is of very durable quality, is





ELEVATION OF THE PRINCIPAL FRONT OF THE MUSEUM, AT BERLIN.

SCHUNKEL ARCHITECT.

J. H. Thompson del.

John B. Knapp sculp.

brought from the Isle of Wight, where the quarries are almost close to the sea; and thus the conveyance of it to Southampton is a mere trifle.

The trade of which the Company have now the promise, indeed we may say the certainty, consists of the Royal Mail Steam Packets to the South of Europe; the West Indian Packet Company, with the exception of the mail-bags, which are to be taken up and landed at Dartmouth. It is probable, however, that this will not continue long, because, by landing the mail at Dartmouth and the passengers at Southampton, the facility of the railway will enable the passengers to reach London a considerable time before the letters; and thus the mails, for early communication, which constitutes one of their chief advantages, will be deteriorated. There is no doubt that other companies, with countless numbers of individuals, will follow the example of these; and that the Southampton Docks and harbour will be in full occupation as soon as they are finished.

There is another point which, though more doubtful, comes reasonably within the grounds of probability; and that is, the landing and shipment of perishable cargoes at Southampton, and their carriage to and from London by the railway. The Railway Company, it may be presumed, will have too much good sense for standing in their own light; and will make the rate of carriage on goods as low as possible. Now, in point of wear and tear of ships, of actual wrecks, and of delays, the voyage between London and Spithead is more than half as costly as the voyage to the West Indies; and West India craft, and others from outwards or inwards in the Channel, will upon the whole save half their insurance by making Southampton their port. This subject would admit of a great deal of amplification, and well deserves it; but we must close this short notice. We cannot however do this, without a word in justice to all the parties concerned. The proprietors appear to understand each other, and act well together; the more immediate managers appear to be very judicious in their conduct, and Mr. Giles, the engineer, does his duty in a manner highly creditable to himself, and profitable to his employers and his country.

THE BERLIN MUSEUM.

We this month present our readers with an accurate elevation of the front of this building. Berlin is usually styled a city of palaces, or at all events of architectural decorations, many of which are executed with a very high degree of taste; and some of the inhabitants themselves arrogate for it the title of "the Palmyra of the North." For this it wants one important element—the power of resisting time and the weather; but this is a subject upon which we are not called upon to enter. Of all those specimens of architecture, the Museum, designed and executed by Schinkel, is admitted to be the gem; and not only this, but it is by common consent the finest production of modern architecture. The architect is one of those extraordinary combinations of talent and acquirement which are not to be expected more than once in five hundred years. He is a Michael Angelo, and his taste in figures and other decorations is as perfect and pure as in the more broad and essential parts of architecture. Therefore, in addition to the perfect symmetry and keeping of his structures, such ornaments as he introduces are the very ones which ought to be introduced, and in the very situations which they ought to occupy. We wonder

what such an artist would think of the conduct of some of our rule-of-thumb architects, who get statues of goddesses, angels, and other imaginary or invisible beings, of which no mortal man can tell what ought to be the proper shape. Having got these, they try the effect of the angels without the goddesses, and of the goddesses without the angels; sometimes by placing them on the top of the attic, or blocking above the cornice, sometimes stuffing them into blind windows, and in short, disposing of them in all whimsical sorts of places. Then, at one time the tips of the wings, palm branches, and triumphal crowns of the angels are gilded, and at others, the tinsel is washed off: and all this goes on, till at last the angels are sent about their business, as much as to say, "palm branches and crowns of victory are not wanted here;" and the goddess, with her shield "round as the moon," is shifted into some notch of the roof, as much out of sight as possible. Now, if the architect had the true feeling of his art, or indeed any feeling of it at all, he would know from the very beginning whether any, and what ornaments, would harmonize with the taste of the building, and would no more think of altering them afterwards than he would think of altering the substantial parts of his structure.

Schinkel's building has another beauty: the exterior and the interior are in perfect harmony, and a proper idea of the whole cannot be formed without some knowledge of both. Therefore, as we purpose to give a representation of the ground plan in our next number, we shall defer what we have to say in the way of description, until that appears.

TO THE EDITOR.

SIR,

I AM induced to write to you in consequence of the letter of H. I. S. in your last number, where he incidentally refers to the Norwich and Lowestoff navigation as an undertaking improperly abandoned. It is not, however, abandoned, and certainly never ought to be abandoned, where the advantages of securing life and property are so surely to be attained by its completion.

The want of a safety harbour at Lowestoff for vessels in distress never was so manifest as at the present time; every year disasters on the eastern coast but the more loudly call on the friends of humanity to make provision against the calamity of shipwreck; where this can be done, as in that most useful project, with large profits to the philanthropist, and security to the mariner, it is presumed that not a day will be lost in effecting so desirable an object.

In consequence of the great sacrifice of life and property on the British coast, commissioners were recently appointed to inquire into and report on the practicability of constructing harbours of refuge, and the most eligible sites for that purpose; their reports have already been made as to the south-eastern part of the coast, and it is understood that their attention will be next directed to the eastern coast. Evidence has already been furnished to the House of Commons, satisfactorily showing, that both national and local advantages would be attained by the construction of an efficient harbour at Lowestoff. Captain Hewett, R. N., who was for many years employed by the Admiralty in surveying this coast, gave it as his opinion, that Lowestoff was the only place along the entire coast from the Humber to the Thames, where an adequate harbour of refuge could be constructed, and that it was much wanted there;

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also, that it would be the means of saving a vast number of vessels and valuable lives. An eminent engineer also supported him in his testimony as to the eligibility of the site.

With respect to the utility and profits to be derived from the harbour of refuge, it is only necessary to state, that between the Humber and the Thames (a most dangerous coast) the annual average number of vessels wrecked within a few miles of Lowestoff, is very great. In the year 1836, the casualties amounted to 110 vessels wrecked and stranded, and 197 lost anchors and cables; the losses on the whole exceeding £150,000, besides numerous valuable lives; all this within a few miles of Lowestoff, most of which would have been prevented had there been such a harbour as is now contemplated.

Through the channel within the sands, many hundreds of traders and colliers to and from our northern ports, from Holland, Hamburg, and the Baltic, pass to the amount of 8,000,000 of tons annually; many anchor in these roads in the regular course of their voyage, and on some occasions, to the number of 700 sail at one time, with no place of refuge in stormy weather.

It is a melancholy and most remarkable fact that, during the late storms, the shipwreck of the *Fairy*, commanded by Captain Hewett, should have happened off the coast of Lowestoff; every soul on board perished, for want of that very harbour of refuge, so strongly recommended by the late gallant commander. Let this fatality be a warning to all who may have the power of supporting the plan, not to lose time in so doing. Let no more valuable lives be forfeited—no more ships or property be lost, when the sure means of saving them all are at hand, and need only to be practised to ensure success and emolument. Had Captain Hewett's recommendation been followed up, his life and that of the crew, and the vessel he commanded, would not have been to be deplored, the more deeply, perhaps, from his solemn and almost prophetic recommendation of it when alive.

In reference to the company formed some 15 years ago, and abandoned after an expenditure of £140,000, I would merely take leave to state, that the object was frustrated by an injudicious use of the sluicing power, instead of the safer one of dredging, in carrying on the works; not only was an enormous outlay incurred thereby, but the far more formidable evil, in stopping the mouth of the intended harbour by the vast quantity of filth carried thither at once; the consequences were so exceedingly disastrous, that vessels could enter only at high water, and not, as they were intended to do, at any time when stress of weather rendered it necessary. Since the sluicing power was abandoned, the tides have gradually removed a part of this stoppage, and a very small comparative expense would now free the entrance of the harbour entirely, and make it what it was intended to be, and will probably soon be,—a safe and commodious and accessible harbour at all times.

In saying this measure was not abandoned, I must not be misunderstood: it was certainly given up by the old company, but a new one is in progress of being formed under better auspices, and with the certainty of success when formed. The errors of the former company will serve as a beacon to the new one; so much has been done and well done before, that but little more is needed now to effect the desired object; and the income of £1700 a year already received, will be in all probability trebled and quadrupled in a very few years.

If you wish for further information on this very interesting subject, I shall be glad to send you another communication; for

certainly where the saving of life, ships, and property, to so large an extent, can be accomplished, the public must participate warmly in the feeling that so deeply affects the interests of humanity.

J. J. K.

15 February, 1841.

[Write again by all means.—CON.]

TO THE EDITOR.

SIR,

A CORRESPONDENT in your Journal of this month, who subscribes himself "Mensor," has done me the favour of attending to the remarks on the "Practice of Parish Surveying" which were inserted in your valuable publication in the month of August last. If "Mensor" possess information on the practice of Land Surveying, I wish he had shown either the inapplicability of those remarks to the subject on which they treat, or that he had appended to them the results of his own experience. By either of those means he would have avoided the corollary which arises from their absence, and which will be sufficiently understood without having recourse to his own phraseology.

In an article headed "Measuring and Plotting a Hill," which appeared in your journal of December, it is stated that "a question has been raised as to the comparative value of the surface of a hill, and the level base upon which that hill stands;" and Mensor, in an indirect manner, has connected that statement with the remarks on "the Practice of Parish Surveying." The writer of those remarks, it must be observed, did no more on that subject than describe the probable motives which influenced the adoption of the practice: he offered no opinion,—and had he considered it useful to present his own inferences, the fact, that vegetable matter grows upon vertical surfaces, would not have failed in having its influence.

The method of measuring a hill so as to plot it accurately on its base, described in the article, "Measuring and Plotting a Hill," is evidently from the pen of an inexperienced person; and however gratifying such mental exercise might be to him "lying in bed not asleep," the result which has been communicated will not be, I fear, of much service to the practical Surveyor. In fact, the "method" described by the disciple of Brindley is the old system of polygonal surveying in a new dress,—and the subject to which it is applied being a variety of planes, in lieu of one plane, will not affect the principle of the system. It is obvious that an antiquated or almost obsolete system has been decorated with an ideal attire; but although such might be satisfactory to a certain class of metaphysicians who take liberties in their chamber of abstractions, I may with safety assert that it will not do with Practical Surveyors.

I am, Sir,

Your obedient servant,

E. J.

Feb. 12, 1841.

REVIEWS.

Public Works of the United States of America. Parts 1 and 2, containing, Descriptions of Seven Public Works, with an Atlas of Forty illustrative plates, beautifully engraved by the Le Keux. The descriptions and specifications by the American Engineers. John Weale, Architectural Library, High Holborn, London.

There are four distinct classes of persons, all deeply interested in the success of the Engineering Arts, and all so conducive to their

advancement, that it depends on the particular case, rather than on the merit of the party, which does the most good.

The first class are the Public, whose advancement in the arts, and whose desire for new accommodations, certainly give the first and grand impulse to the whole; and without them there would be no engineering invention or labour.

The second party are the Engineers themselves, in their various shades and degrees of talent, according to the labours which they are called upon to perform.

The third class consists of those who find funds for carrying on engineering speculations; and they, though they certainly do, to some extent or other, promote Engineering, may be bad or good according to circumstances. If the scheme be in itself a necessary one, useful to the public, and fairly and honestly gone about in all the steps of its progress, the projectors stand upon high and honourable ground; but there is ground of a very opposite description which is also not unfrequently occupied, and this frequency is apt, in the estimation of the discerning part of the public, to bring the whole party into suspicion.

The fourth class consists of those spirited publishers, who exert their labours and expend their capital—generally to a large amount—in laying before the public and the Engineering professions of every country, a full, clear, and explicit account of what has been recently done, what is doing, and what is projected to be done in all other countries. There are various degrees of merit in this class, according to the objects which the parties have in view. The humblest order consists of those who simply record the transactions of the Engineering world as they take place, without any inquiry either as to principles or to results. Humble as it may seem, however, it is, when rightly done, of the very greatest importance. These reports are the materials out of which the History of Engineering has to be formed; and from the generalizations of which merely insulated facts are to be formed into systems of principles for future use. The grand merit of it, however, consists in the fidelity and tact with which it is executed; for if it does not record the truth, or if it perverts the truth for personal or party purposes, it is worse than useless. That much good has been done by the faithful discharge of this duty, is readily admitted, but we must also admit that the perversion of it has been a source of great evil.

We pass over many intermediate orders and sections of orders, and proceed at once to what we consider as the highest and most meritorious of the class. This consists of those who publish detailed accounts of important works, or of the progress and state of the greater public accommodations in all countries; and candour requires that we should place Mr. Weale at, or nearly at, the head of British publishers of this description; and such is the tact with which his works are selected, and the taste with which they are brought out, that his success may be said to be commensurate to his merits. This is the more praiseworthy, inasmuch as works of this kind, in order to be at all worthy of their subjects, must be rather expensive; at the same time that they are not mere picture books to attract the gaze of the multitude. The illustrative engravings to such books are to be read as well as looked at; for they have a meaning far higher, more valuable and lasting, than any pictorial effect which could be given to them. The book under notice is of this nature; and it is highly valuable, as bringing to our view the progress of improvement in a rising country on the opposite shore of the Atlantic. Indeed, in thus bringing the real improvements of any one nation to the view of other nations, it is of small

consequence what the actual progress of the nations so delineated may be; for though an advanced people cannot learn so much from a race behind them as can be learned in the opposite case, yet one often sees by what different means the same results are arrived at by different nations, and in different parts of the world. Those parties called inventors, profit in an extraordinary manner by this general publication of what has been found out—that is, they might so profit were they so minded. There are many instances on record of inventions being made and boasted of in one country, many years after they had become established every-day truths in another country; nor do we want instances of those who keep fagging away in order to complete inventions, which all the intelligible world knows are downright impossibilities, and contradictory of the simplest and best-established principles of science.

1. The first public work, to which the attention is directed in this very interesting collection, is the erection of the gas works at Philadelphia. The importance which Mr. Merriek, the engineer, and his countrymen generally, attach to this work, is shown by the extent of space devoted both to the letter-press and to the plates. It strikes a Briton as a little singular, that there should have been no works for lighting the city of Philadelphia with gas, previous to the year 1835. This, however, is part of a prejudice, which applied pretty generally to gas works, steam navigation, and railroads, on their first introduction. All such subjects are of too much magnitude for being grasped by ordinary minds, during the first and shadowy state of our knowledge of them; and when a subject is thus too mighty for most minds, fear mingles with the thought of it, and suspicions are founded that it is highly dangerous, even in those points in which it is far more secure against accident, than any of those less efficient contrivances for which it is destined to become so much more valuable a substitute. In the course of time, these prejudices wear away, and the distribution of such sensible, temperate, and complete treatises as this, on the Philadelphia gas works, tends greatly to the removal of such prejudices. In this country, such means of disseminating truth may not be so much wanted as they are in America; but still the public generally are greatly indebted to Mr. Weale, for his very complete account of a gas work, accompanied by such details of all its parts, as that any one conversant with the erection of buildings and machinery can readily construct such works wherever they may be necessary. Considerable pains appear to have been taken in examining the gas works of England and Scotland, in order to ascertain the best means of procuring and purifying gas; and the works give every satisfaction, and supply light at a moderate expense.

2. The second work mentioned, is a reservoir dam across the Swatara, in Pennsylvania; and

3. Is a representation of twin locks, on the Schuylkill canal, at Plymouth.

4. Is an account of a breakwater, constructed in the Delaware Bay, after the model of those at Cherbourg and Plymouth. Much attention appears to have been paid to the French and English works, in their power of resisting the action of the waves; and the American engineer seems to have made very judicious modifications, so as to suit his breakwater to the difference of circumstances.

5. The Philadelphia water works. As these supply the city with water from the river Schuylkill, and are so contrived as to furnish pure water, even when the river is foul with freshes—they are unique; and we quote the following as a specimen of American, with all its peculiarities.

EXTRACT FROM THE REPORT OF THE PHILADELPHIA WATERING COMMITTEE.

January, 1837.

The Watering Committee, in submitting their annual Report on the great public work committed to their care, deem it proper to present to the Councils a more extended notice of the Fair Mount Water Works, than has been given since the year 1823, when the completion of what may be termed the experimental part of the water works was presented by our much respected fellow-citizen, the late Joseph S. Lewis, Esq., in the Report of the Committee for that year.

In the year 1799, the attention of the citizens of Philadelphia was first directed to the subject of obtaining for domestic purposes, a copious supply of pure and wholesome water; and at the same time that so indispensable a necessary of life was obtained, to secure an ample quantity of the same element for the protection of the dwellings and property of the inhabitants from conflagration. Recourse was had to steam power to carry the views of the first projectors into effect; and, after two sets of works had been erected and crowned with success, which, for the then limited population, was deemed satisfactory, the forecast of the Councils, who at that time administered the affairs of the city, seized on the favourable circumstances of the improvement of the navigation of the river Schuylkill, to lay the foundation of the splendid works which are now the pride and ornament of Philadelphia. Acquiring, under the several contracts with the Schuylkill Navigation Company, the whole of the water and water power of the river Schuylkill, at Fair Mount, which might remain after supplying the locks and canal constructed by the city, to complete the navigation at that point, the Corporation has continued from year to year to make the most liberal appropriations for the completion of the works; and we now behold them with a capacity to supply the wants of a population twice as numerous as that now embraced within the limits of the city and adjoining districts. During the past year, the two remaining sections of Reservoir No. 4 have been finished; and the Committee have the pleasure to state, that, although the reservoirs are elevated 102 feet above the level of the tide in the river Schuylkill, with portions of them resting on upwards of 90,000 yards of artificial embankment, they have great solidity, and are all in good order. With the exception of some slight filtration through the rocky substratum of the reservoir last constructed, they are water-tight, and the Committee have no doubt, that when the materials of which that is built have consolidated, it will also become perfect. The water rents payable from the city and districts, for the year 1837, amount to 106,432-37 dollars, and are thus distributed:—

	Dollars.
City of Philadelphia	57,080 50
Ditto, for the Girard Estate, and rents charged to H. J. Williams, for factories, &c., near Fair Mount	1,048 50
District of Spring Garden	13,674 25
District of the Northern Liberties	20,009 37
District of Southwark	10,517 50
District of Moyamensing	1,956 00
District of Kensington	2,146 25
Dollars	106,432 37

The water works at Fair Mount, as at present in operation, consist of a dam upwards of 1,200 feet in length, of a peculiar construction, and the race and mill-buildings minutely described in the Report of 1823; six water wheels, and as many double forcing-pumps, varying in a slight degree in the diameter of the wheels, and in the length of the stroke of the pumps, but conforming in their structure and appearance to the original plan; and four reservoirs, divided into convenient sections, covering a superficial area of upwards of six acres. The average quantity of water raised by each wheel and pump, daily, for the past year, was about 530,000 gallons, which is elevated into the reservoirs 102 feet above the level of the tide in the Schuylkill, and distributed from thence through 98½ miles of iron pipes, which can be separately controlled by a very simple apparatus. The reservoirs are built of stone, and paved with bricks, laid upon a very tenacious clay puddle in strong lime cement, and covered with grouting to prevent leakage. They are surrounded by an artificial embankment 38 feet high, the base line of which is about 40 feet, composed of strong clay immediately in contact with the walls of the reservoirs, and forming a belt about 2 feet thick, and the remaining portion of good loam, the whole being neatly faced with grass sods, which prevent washing. The reservoirs are each 12½ feet-deep, and will contain, when filled, upwards of 22,000,000 gallons of water. The pumping apparatus now in use will furnish a supply of 6,000,000 gallons per day, and that quantity may be increased to 8,000,000 gallons daily, by the erection of two more wheels and pumps, which will complete the original design, and fill up the mill-buildings. The whole cost of these works to the 1st

instant, amounts to 1,381,031-43 dollars, which includes all the pipes and fixtures of the old steam power works applicable to the distribution of water on the present plan.

The following statement exhibits the extent of the works, the number of tenants supplied, the quantity of water daily distributed, and the amount of revenue for the years 1823 (at which time the city only was supplied with water) and 1837 respectively. In 1823, the three wheels and pumps were in operation, 6½ miles of iron pipes were laid, 4,844 tenants were supplied with 1,616,160 gallons of water daily, and the revenue was 26,191-05 dollars per annum. In 1837, six wheels and pumps were in operation, 98½ miles of iron pipes are laid, 19,678 tenants are supplied with 3,122,164 gallons of water daily, and the revenue is 106,432-37 dollars.

In conclusion, while the Committee congratulate the Councils on the present condition and prospects of Fair Mount Water Works, they cannot omit paying a public tribute of respect to Frederick Graff, Esq., who for nearly thirty-two years, in the arduous and responsible duties of Engineer and Superintendent of the works, has most signally contributed to their success, and won for himself an enduring name, and the lasting gratitude of his fellow-citizens.

JOHN PRICE WETHERILL,
Chairman of the Watering Committee.

Philadelphia, Jan. 5, 1837.

Particulars relating to the Fair Mount Water Power Works, from their commencement up to December 31st, 1836.

The dam was commenced April 19, 1819, and finished July 23, 1821.

The great ice-freshet, which rose 9 feet above the dam, took place February 21, 1822.

The corner stone of the mill-buildings was laid April 28, 1821.

The wheel and pump No. 1. was first put into operation July 1, 1822

No. 2.	do.	do.	Sept. 14, 1822
No. 3.	do.	do.	Dec. 24, 1822
No. 4.	do.	do.	Nov. 10, 1827
No. 5.	do.	do.	April 5, 1832
No. 6.	do.	do.	Nov. 5, 1834

The 22-inch iron main was laid in 1820.

The 20-inch iron main was laid in 1829.

Each of these is nearly 10,000 feet in length.

	Gallons.	Gallons.
The reservoir No. 1 was finished in 1815; containing	3,917,659	
The reservoir No. 2 was finished in 1821; containing	3,296,434	
The reservoir No. 3 was finished in 1827; containing	2,707,295	
The first section of reservoir No. 4 was finished in 1835; containing	3,658,016	
The second section of reservoir No. 4 was finished in 1836; containing	4,381,322	
The third section of reservoir No. 4 was finished in 1836; containing	4,071,250	
Gallons	14,817,883	

The reservoirs contain together 22,031,976

	Dollars.
Reservoir No. 1 cost	32,508 52
Reservoir No. 2 cost	9,579 47
Reservoir No. 3 cost	24,521 75
First, second, and third sections of reservoir No. 4 cost	67,214 68
Dollars	133,824 42

The waters of the reservoirs cover a surface exceeding six acres. The reservoirs are each 12 feet 3 inches deep, and are elevated above the water in the dam 96 feet perpendicular.

The water flowing from the reservoirs for the supply of the city and districts, per day, at different periods of the year 1836, was as follows:—

(In very cold weather), from Feb. 1 to 21	1,769,800
Feb. 21 to March 20	2,113,257
March 20 to June 3	3,046,120
June 3 to July 22	3,942,643
July 22 to Sept. 9	4,152,917
Sept. 9 to Oct. 28	3,679,800
Oct. 28 to Dec. 31	3,154,114

The average daily supply in 1836 was 3,122,664 gallons.

The above supply of water is distributed to 10,632 tenants by private hydrants, and to 3,000 families by hydrant pumps.

			Tenants.
In the city to			13,632
And by private hydrants in the district of Spring Garden to			1,762
do. do. Southwark to			1,287
do. do. Northern Liberties to			2,535
do. do. Moyamensing to			228
do. do. Kensington to			234
Together			19,678

Being an average daily supply to each tenant of 160 gallons.

The quantity of iron pipes laid for the distribution of the water is as follows:—

	Miles
In the city	58
In Spring Garden	11½
In Southwark	10½
In the Northern Liberties	12½
In Moyamensing	2½
In Kensington	3½
Together	98½

The water rents, up to the 31st December, 1837, were as follows:—

	Dollars.
For the city	57,080 50
Including rents on the Girard Estate, and rents due by H. J. Williams and others, at Fair Mount	1,048 50
For Spring Garden	13,674 25
For Southwark	10,517 50
For the Northern Liberties	20,009 37
For Moyamensing	1,956 00
For Kensington	2,146 25

Together, Dollars 106,432 37

	Dollars.
The expenses for the Water Power Works, connected with the applicable parts of the former steam works, were, December 31, 1831	1,138,323 54
Add the expenses for reservoirs, iron pipes, &c., in 1832	65,195 58
Do. do. in 1833	37,354 06
Do. do. in 1834	65,163 36
Do. do. in 1835	73,288 38
Do. do. in 1836	71,706 51

Dollars 1,451,031 43

From which deduct, for the support of working machinery, materials, salaries, &c., 14,000 per annum for the last 5 years	70,000 00
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Leaving the expenditure for the permanent works, up to the 31st December, 1836 . . . Dollars 1,381,031 43

The contract for supplying the district of Spring Garden with water, was signed April 26, 1826.

The second contract for the extension of the water from Broad-street to the Schuylkill, October 10, 1831.

Agreement with Southwark signed June 1, 1826.

Agreement with the Northern Liberties signed June 6, 1826.

Agreement with Moyamensing signed January 6, 1832.

Agreement with Kensington signed October 5, 1833.

FREDERICK GRAFF,
Engineer and Superintendent of
Fair Mount Water Works.

Particulars relating to the Fair Mount Water Works.

There are six wheels and pumps now placed at Fair Mount, which are capable of raising 61,330 gallons per hour, or per twenty-four hours, 8,831,520 gallons.

The daily consumption of water used in the city and districts, during the year 1837, was as follows:—

	Gallons.
From January 6 to March 31, a term of 12 weeks, the supply was per day	2,418,154
From March 31 to June 23 do. do.	3,469,525
From June 23 to Sept. 15 do. do.	4,205,485
From Sept. 15 to Dec. 18 do. do.	3,732,368

The average daily supply for the year 1837 was 3,456,383 gallons.

			Tenants.
The above supply of water was distributed to 10,977 tenants by private hydrants, and to 3,000 families by means of public hydrant pumps placed in the city, together equal to			13,977
And by private hydrants in the district of Spring Garden			1,925
Do. do. Southwark			1,366
Do. do. Northern Liberties			2,621
Do. do. Moyamensing			295
Do. do. Kensington			278

Together 20,462

Statement of iron pipes laid in the city and districts, commencing October, 1819, to December, 1838.

	Feet.
City of Philadelphia	326,128
Spring Garden	72,604
Northern Liberties	69,961
Southwark	55,616
Moyamensing	14,872
Kensington	23,969
Together	563,150

Equal nearly to 106½ miles.

The daily consumption of water used in the city and districts during the year 1838 was as follows:—

	Gallons.
Fram January 1 to April 1, the average daily supply of water was	2,628,428
From April 1 to July 1	3,942,642
From July 1 to Oct. 1	5,151,720
From Oct. 1 to Dec. 31	3,679,800

Being an average for the year of 3,850,647 gallons.

The water rents, up to the 31st December, 1838, were as follows:—

	Dollars.
For the city	60,081 25
For Spring Garden	45,046 50
For Northern Liberties	20,651 37
For Southwark	11,236 25
For Moyamensing	2,373 00
For Kensington	2,503 00

Dollars 111,891 37

	Dollars.
The expenses for the erection of the Water Works, and for iron pipes, &c., up to Dec. 31, 1836, were	1,381,031 43
Add for the extension of the iron pipes, for the completion of the reservoirs, and other permanent improvements, to December 31, 1837	35,730 10

Making the expenditure for the permanent work Dollars 1,416,761 53

The remainder of the published parts are devoted to works of aquatic engineering of some description, such as dams, locks, aqueducts, and others. This is in fact the characteristic engineering of the maritime part of the United States; and both in their local situations and their materials, the Americans possess some peculiar advantages. The chief of these are the quantity of timber which the Americans can use in their aquatic works; and the comparatively small trouble they will have in managing the off-fall of water upon dams thrown across the rivers for the purpose of procuring a head of water for any purpose whatsoever. In Britain, unless in very peculiar situations, there is always a current produced by the off-fall, which extends much beyond the limits of any ordinary dam or weir. If the current of the river is a rapid one, and especially if it is subject to high and frequent floods which have to flow over the top of the dam, there the management of the off-fall, and the tail of the dam, where it merges in the common bed of the river, are matters of some nicety, and often baffle engineers of considerable reputation, in giving them stability in the very place where one ignorant of their action would be apt to think they needed it least. The Americans are troubled with no such niceties. Their dam is a

triangular prism, framed of timber, and loaded with stone; and the off-fall is simply a plane, with seldom more than three feet base to one foot rise. The tail of this dam seldom gives them any trouble, as it is generally in such a depth of still water as to exhaust the force of the current which flows over the dam; and it is not unfrequently in tidal water to this depth. Such dams are cheap, easily constructable, and last for a considerable time; so that with all their ice-breaking beams and other appendages, they render artificial navigations upon a small scale very easily constructible, and of great service to the low lying districts. In most British rivers, on the other hand, the water will cut into the tail of the dam, displace the stones there, even though they are of large dimensions, and thus gradually loosen the whole structure up to the crown, so that when a violent flood comes, it will either sweep away the dam entirely, or make a breach, the repairing of which will cost nearly as much as a new structure. Various forms of the longitudinal section of curves have been suggested and in part adopted for this purpose. Of these a parabola or cycloid have been considered as the best, and in theory it is no doubt that they are so. Both of them send the water over the tail of the dam in a horizontal current, and the cycloid sends it with the maximum velocity that can be obtained from the same quantity and fall of water. But somehow or other, as we find in most cases where we have the motion of water to deal with, the practical results never agree with the theory. Running water appears to have what may be called a feeling of the nature of the bed over which it flows; and it works upon that without reference to the absolute line which we give to the surface current. This is one of the grand difficulties which a British engineer has to contend with when he deals with currents of water, and the absence of this difficulty is a great advantage to the American.

We give the following specification of dam No. 1 on the eastern division of the Sandy and Beaver canal, as a specimen of this description of work; and the reader will see how different it is from what a work for a similar purpose would require to be in most parts of Britain:—

The manner of constructing the dam will be as follows:—Six spaces shall be excavated across the stream to the depth required by the engineer, or at least two feet below its bed; in those spaces foundation timbers, 10 inches square, are to be laid; on these timbers the sheeting timbers of the dam are to be placed, and firmly pinned to them with locust pins, 2 inches in diameter and 22 inches long; six pins to each sheeting timber. The foundation timbers are to let into the sheeting timbers 2 inches, the sheeting timbers are to be 10 inches square, and to extend 12 feet below the breast of the dam, and are to be laid at right angles to the foundation timbers close together, every fifth stick to be the full length up-stream of the dam; the remainder to be 14 feet in length, and to extend from abutment to abutment. The dam is to have a base of 3 feet to every foot in height, exclusive of the 12 feet below the breast for sheeting.

After the sheeting has been laid and bolted, two rows of timber, 12 inches square, one at the head of the dam, and the other 12 feet above the lower end of the sheeting, are to be laid on the sheeting timbers, at right angles thereto, and the entire space between them to be covered with 2-inch plank. These timbers shall be let into the sheeting timbers 2 inches, and connected together by white oak ties, 10 inches square, dovetailed accurately and tightly fitted into tenons made in the timbers to receive them. The ties are to be placed 10 feet apart on each course of timber; the back and front logs are to be placed over and to rest on each other for the first 4 feet in height of the dam, the front logs to be carried up perpendicular, the back logs to batter 3 inches for each foot in height. Wherever a tie connects with a timber, it must be fastened with a locust pin, 2 inches in diameter and 30 inches long; these ties must be inserted in every course of timbers at each 10 feet in length of the dam.

The whole is then to be carried up by means of back, front, and intermediate logs, as shown on the plan, till it is raised within 19 inches of the contemplated height, being filled, as it progresses, with stone closely packed.

After the dam has been raised, as above mentioned, within 19 inches

of its height, the last course of ties being 4 feet apart, eight courses of 10 by 10-inch timbers are to be laid across the dam at equal distances apart, at right angles to the ties, and resting on the last course, and firmly bolted to them. The whole upper and lower or face surface of the dam must be covered with 3-inch white oak plank, well and tightly fitted; the plank to rest on the timbers last above described, and on the ends of the ties and front logs, and to be secured to them by wrought-iron spikes, 8 inches long. On the upper plank must be secured ice-guards, 6 inches thick at the butt and tapering to an edge, each guard-plank to be 10 feet long, and to be fastened with 14-inch wrought-iron spikes, five spikes to each plank.

The upper and lower ends of the dam are to be well sheet-piled with 2-inch white oak or pine plank battened; there is also to be a row of sheet-piling under the breast of the dam, the sheet-piles not to be less than 4 feet long.

All the timber used in the construction of the dam must be perfectly sound, free from rot or sap, and no other timber than white oak, chestnut, oak, pine, or hemlock, will be permitted to be used. The plank must be of the best quality of white oak, perfectly sound.

There is to be a sluice in the dam, of such width and description as the engineer may require. The up-stream side of the dam is to be well gravelled; the abutments are to be built of large cut stone, coursed and laid in hydraulic cement, and coped with stones 3 feet wide and 12 inches thick, cut and laid in a workmanlike manner. The abutments are to be sheet-piled on the back, and wherever the engineer may require.

Bill of Timber, Plank, Iron, and Stone Filling, for 100 feet in length of Dam No. 1, 15 feet high.

4500 linear feet of mud sills and range timber, 10 by 10 inches square, not less than 30 feet long.
 120 sticks, 10 by 10 inches square, 20 feet long.
 20 sheeting-sticks, 10 by 10 inches square, 60 feet long.
 105 ties, 10 by 10 inches square, 40 feet long.
 10 supports, 10 by 10 inches square, 9 feet long.
 3700 feet 3-inch plank, and 100 ice-guards, 10 feet long.
 7800 feet 2-inch plank.
 2000 feet boards.
 1000 pounds of 8-inch bolts, $\frac{1}{4}$ inch square.
 600 pounds of 14-inch bolts, $\frac{1}{4}$ of an inch square.
 200 pounds of spikes, 6 inches long.
 1600 cubic yards of stone filling.
 Sum total of timber, 12,390 linear feet.

The following specification will also show the peculiarities of locks in American canals:—

Locks—Dimensions.—Locks shall be 90 feet long in the chamber between the upper and lower gates, and 15 feet broad in the clear. The foundation shall be laid at such level or elevation as the engineer may prescribe, but in all cases so low that the top of the lower mitre sill will be 4 feet below the top water line of the canal below the lock. When a good even foundation of solid, compact, and durable rock cannot, in the opinion of the engineer having charge of the work, be procured at the proper elevation, the foundation shall be composed of good, sound, hard, and durable timber, hewed square, and not less than 10 inches in thickness, which shall be laid horizontally crosswise of the lockpit, level and even, not less than 3 nor more than 5 inches beyond the outward base of the walls. This timber shall rest on a bed of good gravel puddle of such depth as the engineer may deem necessary and shall direct, into which it shall be driven or sunk at least one inch, and the spaces between the timbers shall also be perfectly filled with good puddle, composed of gravel and such other suitable materials as said engineer may designate, which shall be thoroughly rammed and packed, beginning at the bottom of each space. Four rows of sheet-piling, to be composed of good, sound, straight, and square-edged white oak plank, set close together, spiked and battened, extending to such depths as said engineer may deem necessary, shall be set in the ground across the foundation, in a ditch to be cut for that purpose, which shall be thoroughly filled with good puddle, well rammed.

A floor to be composed of good sound 2-inch pine, or white oak plank free from shakes, well jointed, so far as to form tight joints, both at the sides and ends, shall be laid over the whole foundation of timber above described, and thoroughly trenailed and spiked down to the timber underneath with 6-inch spikes. Over this floor and between the lock walls, a second floor of good sound 2-inch pine or white oak plank, well jointed and water-tight, is to be laid, and firmly spiked to the first with 6-inch spikes.

The thickness of the lock walls, and all other matters relating to the

locks not herein specified, to correspond with the plans and directions of the engineer.

The face of the lock walls shall be laid in courses, or range work, composed of cut stone: the stone forming each course to be of equal thickness throughout the whole course. No face stone shall be less than 1 foot in thickness, unless the engineer shall admit of stone of less thickness to be used. Every face stone shall be at least 14 inches in breadth throughout its whole length, and in no instance shall be of less breadth than thickness. No face stone shall be more than half an inch thicker at the face than at the back, and shall be as nearly of uniform thickness throughout as may be. The joints or edges of face stone shall be straight and square both on the beds and at the ends, and the corners full, making close joints at the ends from the face back 12 inches at least. Headers not less than 2 feet broad, and 4 feet 6 inches in length, and as large throughout the whole length as at the face, shall be prepared and laid into each course, except the bottom and top courses of the face wall, not more than 10 feet apart, measuring from centre to centre, in any place, and so arranged that the headers in each successive course will be placed over the space between headers in the course beneath.

The face stone of the locks shall be laid on good, well wrought mortar, free from pebbles and lumps of raw lime. The mortar shall be composed of proper proportions of good water-proof lime and clean sharp sand, the proportions of each to be determined by the engineer. The stone shall be laid with close joints, not exceeding in any case $\frac{1}{8}$ ths of an inch in thickness; and both the horizontal and perpendicular joints shall be thoroughly and completely filled with mortar, extending from the face of the wall at least 12 inches back. The face stone shall be thoroughly wet before being laid, and the walls shall be kept constantly wet during the time of their being built, and the face stone shall break joints in all cases at least 12 inches. The coping stone shall be at least 3 feet in breadth, of uniform thickness at the face and on the back, and shall be cramped together with iron cramps of the proper form and size. The head of the lock on each side shall be defended by placing a heavy stone of at least 2 feet in thickness, 2½ in breadth, and 5 feet in length, in the upper course extending from the gate recess at the head; the joints to be all pointed with Roman cement.

Backing.—All parts of the lock walls not occupied by the face stones shall be composed of good large solid stone, well shaped, so as to form a strong bond throughout the whole, none of which shall measure less than 5 cubic feet; all the stones are to be hammer-dressed, so as to have good square joints and level beds, and to be laid close; all the backing stones to have the same thickness that the face stones in front of them have. Headers not less than 12 inches in thickness and 24 inches in breadth throughout their whole length, and extending from the back into the wall 4 feet (or at least so far as the face stone will permit them to extend), shall be so placed as to correspond with each course of the face wall, and so that one header from the back side shall extend into each space between the headers of the face; the back and face headers interlocking with each other so as to bind the whole wall firmly together. The wall shall be grouted throughout its whole extent, after laying each course of face stone and raising the back wall even therewith from time to time as the wall advances in height, and more frequently if the engineer having charge of the work shall direct.

All stone used in building locks shall be solid, firm, and durable, not liable to be affected by the action of water and frost; especial care must be taken to see that all face stones are of this character. No stone is to be cut, dressed, or hammered on the wall; the walls are at all times to be kept perfectly clean and free from sand or dust by means of brooms, and are not to be embanked for at least one month after their completion.

The lock gates and mitre sills shall be made agreeably to plans to be furnished by the engineer having charge of the work, and shall be composed of good, sound, solid, white oak timber and plank, and thoroughly secured with iron of good quality and proper dimensions, made and formed agreeably to bills and plans to be furnished by said engineer.

Fender beams and posts of proper size and dimensions, of good sound white oak timber, shall be placed and secured at the head and foot of the locks agreeably to a plan to be furnished, and the directions which shall be given by the engineer having charge of the work.

The bottom and sides of the canal, extending from the foot of the lock at least 40 feet, shall be secured from the action of the water passing through the valves by being paved with rough stone, as may be directed by the superintending engineer. A tumble to be built, agreeably to a plan to be furnished, of cut or hammer-dressed stone, if required by the engineer, to pass the water from the level above to that below the lock.

We might have added some remarks and illustrations of American locks and aqueducts; but our limits are already reached, and we

must content ourselves by referring to the work itself, the plain and simple style of which, notwithstanding several expressions that sound somewhat singularly to British ears, will prevent any person of ordinary intelligence from misunderstanding the meaning. Then the plates are so circumstantial, so clear, and so well made out, that they themselves are more intelligible than many letter press descriptions.

The third part of the work is in preparation, and will be chiefly devoted to various descriptions of locomotive and marine engines, to which the Americans have paid great attention.

The professions especially, and indeed the public generally, are highly indebted to Mr. Weale for bringing forward this work in a manner so splendid and so truly useful; and this is only one out of many projects for the advancement of the professions which the same spirited publisher has in petto, and which we shall have the pleasure of noticing from time to time.

MR. LABOUCHERE'S RAILWAY BILL,

As brought into the House of Commons.

WHEREAS by an Act passed in the third and fourth years of the reign of her present Majesty, intituled, "An Act for Regulating Railways," provision was made for the supervision of railways: and whereas it is expedient, for the safety of the public, to make further provision for that purpose.

Be it enacted, by the Queen's most excellent Majesty, by and with the advice and consent of the lords spiritual and temporal, and commons, in this present Parliament assembled, and by the authority of the same, that this Act shall come into operation on the passing thereof.

And be it enacted, that the provisions of the said recited Act and of this Act shall be construed together as one Act, except so far as the provisions of the said recited Act are hereby repealed, or shall be inconsistent with the provisions of this Act.

And whereas by the said recited Act it is enacted, that after two months from the passing of the said recited Act, no railway, or portion of any railway, shall be opened for the public conveyance of passengers or goods until one calendar month after notice, in writing, of the intention of opening the same shall have been given by the Company to whom such railway shall belong to the lords of the committee of her Majesty's privy council appointed for trade and foreign plantations: and whereas by the said recited Act it is also enacted, that if any railway, or portion of any railway, shall be opened without due notice as aforesaid, the Company to whom such railway shall belong shall forfeit to her Majesty the sum of twenty pounds, for every day during which the same shall continue open, until the expiration of one calendar month after the Company shall have given the like notice as is hereinbefore required before the opening of the railway, and any such penalty may be recovered in any of her Majesty's courts of record; be it enacted, that the said recited provisions of the said Act shall be and they are hereby repealed.

And be it enacted, that no railway, or portion of any railway, shall be opened for the public conveyance of passengers until one calendar month after notice in writing of the intention of opening the same shall have been given by the Company to whom such railway shall belong to the lords of the committee of her Majesty's privy council appointed for trade and foreign plantations, and until ten days after notice in writing shall have been given by the said Company to the lords of the said committee that the said railway, or portion of railway, is sufficiently completed for the safe conveyance of passengers, and ready for inspection.

And be it enacted, that if any railway, or portion of any railway, shall be opened without such notice as aforesaid, the Company to whom such railway shall belong shall forfeit to her Majesty the sum of twenty pounds for every day during which the same shall continue open until the said notices shall have been duly given and shall have expired; and every such penalty may be recovered in any of her Majesty's courts of record.

And be it enacted, that if the lords of the said committee shall be of opinion that the opening of any railway, or portion of a railway, would be attended with danger to the public, it shall be lawful for the lords of the said committee from time to time to order and direct the Company to whom such railway shall belong to postpone such opening for any period not exceeding one calendar month at any one time, until it shall appear to

the lords of the said committee that such opening may take place without danger to the public; and if any such railway, or any portion thereof, shall be opened contrary to any such order and direction of the lords of the said committee, the Company to whom such railway shall belong shall forfeit to her Majesty the sum of *twenty pounds* for every day during which the same shall continue open contrary to such order and direction, and such penalty may be recovered in any of her Majesty's courts of record.

And be it enacted, that the lords of the said committee may order and direct any Railway Company to make up and deliver to them such returns of accidents occurring in the course of the public traffic upon the railway belonging to such Company, and also such returns of the arrangements for conducting the public traffic thereon, as the lords of the said committee shall deem necessary for their information with a view to the public safety; and if any returns herein mentioned shall not be so delivered within *seven* days after the same have been required, every such Company shall forfeit to her Majesty the sum of *twenty pounds* for every day during which the said Company shall neglect to deliver the same, and every such penalty may be recovered in any of her Majesty's courts of record.

And whereas by the said recited Act it is enacted, that every officer of any Company who shall wilfully make any false return to the lords of the said committee shall be deemed guilty of misdemeanor: and whereas it is expedient to extend the said provision; be it enacted, that the said provision shall be and is hereby repealed.

And be it enacted, that every officer of any Company who shall wilfully give or make any false notice or return, or certificate or other instrument or document which shall be required to be given or made for the purposes of this and the said recited Act, to or for the use of the lords of the said committee, shall be deemed guilty of a *misdemeanor*.

And be it enacted, that it shall be lawful for the lords of the said committee to issue from time to time such regulations as they shall deem necessary for the prevention of accidents upon railways: provided always, that such regulations shall not prescribe any thing of an experimental nature, nor interfere with the number of trains, nor with the times of starting the trains, nor with the speed of travelling on any railway further than is necessary for the purpose of preserving an interval of not more than *fifteen* minutes between succeeding trains: provided also, that no such regulation as aforesaid shall be binding upon any Railway Company, unless the lords of the committee shall have given to such Company *twenty-one days'* notice of their intention to issue the same.

And be it enacted, that if any Company shall fail to observe any such regulation of the said committee, such Company shall forfeit to her Majesty the sum of *twenty pounds* for every day during which such Company shall so fail to observe any such regulation; and every such penalty may be recovered in any of her Majesty's courts of record.

And be it enacted, that whenever the lords of the said committee shall order the postponement of the opening of any railway, or shall issue any regulation for the prevention of accidents, in pursuance of the provisions in that behalf in this Act contained, they shall make a minute, specifying the grounds of such order or regulation; and copies of every such minute shall be laid before both Houses of Parliament within *one month* after such minute shall be made, if Parliament be then sitting, and if Parliament be not sitting, then within *one month* after the commencement of the next Session of Parliament.

And whereas by the said recited Act, the lords of the said committee are empowered to disallow all bye-laws, orders, rules or regulations made by Railway Companies, which shall impose penalties for the enforcement thereof upon persons other than the servants of such Companies, and for that purpose all such bye-laws, orders, rules, and regulations are thereby required to be laid before the lords of the said committee: and whereas it is expedient to extend the provisions of the said Act to all such bye-laws, orders, rules or regulations made, or to be hereafter made by any Railway Company which are of a public nature, and relate to or affect other persons than the proprietors, officers, and servants of such Company, shall be returned to the lords of the said committee, and shall be subject to the powers and provisions in the said Act contained in regard to the bye-laws, orders, rules and regulations therein mentioned.

And be it enacted, that on and after the next after the passing of this Act, no person shall be employed on any railway as an engine-driver, in the course of the public traffic, unless he shall have been licensed in pursuance of the provisions of this Act in that behalf; and if any person shall be so employed on any railway, without having first deposited his licence with the Company to which such railway shall belong, such Company shall forfeit to her Majesty *five pounds* for every day during which such person shall be so employed, and every such penalty may be recovered in any of her Majesty's courts of record.

Provided always, and be it enacted, that in cases of emergency it shall be lawful for any Railway Company to employ any competent person, whether duly licensed or not, to act as engine-driver in the course of the

public traffic, for any period not exceeding *seven* days, or such further period as shall be sanctioned on each occasion by the lords of the said committee: provided always, that whenever an unlicensed person shall be employed, the Company shall give to the lords of the said committee within *forty-eight* hours after such employment, notice thereof, together with a statement of the reasons thereof.

And be it enacted, that it shall be lawful for the lords of the said committee to cause to be examined any person nominated by any Railway Company for the purpose of being licensed to act as engine-driver, and to license any such person as shall appear to the lords of the said committee to be duly qualified for that purpose, and if and when they see fit, to revoke or suspend the licence of any such person.

And be it enacted, that it shall be lawful for the lords of the said committee to appoint, from time to time, two or more persons, one of whom shall be the engineer of the Company, or some engineer selected by the Company by whom the candidates to be examined shall have been nominated, to examine the candidates for licences to act as engine-drivers, and the said examiners shall examine such candidates at such times and in such manner as the lords of the said committee shall appoint.

And be it enacted, that there shall be kept in the office of the committee of privy council for trade and foreign plantations a register of licences, in which shall be entered the particulars of every licence granted in pursuance of this Act; and in all courts, and before any justice of the peace, and upon all occasions whatsoever, certified copies of the entries made or contained in such register shall be received as evidence, and be deemed sufficient proof of all matters and things therein registered or contained, without requiring the production of any such register, or of any licence or other document upon which such entries shall be founded, and without any further proof than the production of such certified copies; and every person shall be at liberty to inspect any such register at all seasonable times without payment of any fee or reward.

And be it enacted, that it shall be lawful for the lords of the said committee to provide badges to be worn by licensed engine-drivers, and every engine-driver to whom any such badge shall have been given, shall at all times during his employment upon any railway in the course of public traffic thereon, and when he shall be required to appear before any justice of peace, wear such badge conspicuously upon his breast, in such a manner that the number thereon shall be distinctly visible and legible.

And be it enacted, that if any person shall act as an engine-driver upon any railway in the course of the public traffic thereon without having a licence, or if any licensed person shall transfer or lend his licence or badge, or shall act as an engine-driver in the course of the public traffic, or attend when required before any justice of the peace, without wearing such badge in manner hereinbefore required, he shall forfeit to her Majesty for every such offence a sum not exceeding *five pounds*.

And be it enacted, that if any person shall forge or counterfeit, or shall cause or procure to be forged, counterfeited, or resembled, any licence or badge to be provided under this Act, for an engine-driver, or if any person shall sell or exchange, or expose to sale, or utter any such forged or counterfeit licence or badge, or if any person shall knowingly and without lawful cause (the proof whereof shall lie on the person accused) have or be possessed of such forged or counterfeit licence or badge, every person so offending, and every person knowingly and wilfully aiding, abetting, or assisting any person in committing any such offence as aforesaid, shall be deemed guilty of a *misdemeanor*.

And be it enacted, that every Railway Company shall retain in their custody the licence of every engine-driver employed by them, so long as such engine-driver shall be in their employment; and in case such engine-driver shall leave or be dismissed from, or shall die in, their service, such Company shall forthwith give notice in writing to the lords of the said committee, and shall retain the licence of such engine-driver until they shall have received directions from the lords of the said committee as to the disposal of such licence; and if such Company shall not give such notice as aforesaid, or shall dispose of such licence without, or contrary to, the directions of the lords of the said committee, every such Company shall forfeit to her Majesty for each offence the sum of *twenty pounds*, and every such penalty may be recovered in any of her Majesty's courts of records.

And be it enacted, that every penalty not exceeding the sum of *five pounds* for any offence against the provisions of this Act, for the enforcement of which no proceeding is hereby expressly provided, shall be enforceable summarily before any justice of the peace having jurisdiction within the place wherein such offence shall have been committed; and in default of payment, upon conviction, of any such penalty, the offender shall be immediately committed to prison, for any period not exceeding *one calendar month*, unless such penalty shall be sooner paid; and every such penalty shall be returned to the next ensuing court of quarter sessions in the usual manner.

And be it enacted, that all notices, returns and other documents required by this Act, or by the said recited Act, to be given to or laid before the lords of the said committee, shall be delivered at, or sent by the post to the office of the lords of the said committee; and all notices, requisitions, orders, regulations, appointments, certificates, certified copies, licences, and other documents in writing, signed by one of the secretaries of the said committee, or by some officer appointed for that purpose by the lords of the said committee, and purporting to be made by the lords of the said committee, shall for the purposes of this and of the said recited Act be deemed to have been made by the lords of the said committee; and service of the same upon any one or more of the Directors of any Railway Company or on the secretary or clerk of the said Company, or by leaving the same with the clerk or officer at one of the stations belonging to the said Company, shall be deemed good service upon the said Company.

And be it enacted, that wherever the word "railway" is used in this or in the said recited Act, it shall be construed to apply to all railways used or intended to be used for the conveyance of passengers in or upon carriages drawn or impelled by the power of steam, or by any other mechanical power; and wherever the word "Company" is used in this or in the said recited Act, it shall be construed to extend to and include the Proprietors for the time being of any such railway, whether a body corporate or individuals, and their lessees, executors, administrators, and assigns, unless the subject or context be repugnant to such construction.

And be it enacted, that this Act may be amended or repealed by any Act to be passed in the present session of Parliament.

THE march attempted to be stolen upon the Companies by the insidious bill brought in by Mr. Labouchere, under the pretence of adding to the public safety, but really for the purpose of setting up a tyranny over railways, and ultimately destroying them, has been at length laid open. Our correspondents, in our last *Magazine*, set the matter in a light so clear as to demonstrate not only the injustice and impolicy of the measure, but its futility and sinister objects against the property of individuals who have done so much good to the country. This new attempt against the property of Companies is precisely what we anticipated last year. We then condemned, over and over, the interference of Government, and called upon the Companies to resist it by every possible means. To a certain extent they listened to us, and, by the prompt and energetic exertions of the Great Western Company, the more obnoxious clauses, which we pointed out, were expunged, but the principle of Government interference, which we then dreaded, was unfortunately established. This, we fear, we owe, almost exclusively, to the vanity and weakness of the Chairman of the London and Birmingham Railway. His friends say, when Lord Seymour consulted him upon the Bill which he was about to introduce, that he took the advice of Mr. Booth and one or two other gentlemen; but, one of our correspondents affirms that the very persons, whose concurrence he is said to have had, strenuously opposed the Bill—a strange way, certainly, of manifesting their concurrence. Be this, however, as it may, there is little doubt but that Mr. Glyn took so active a part in the Bill as to add one or more clauses to it, and did not consult the other, near 20 Railway Companies, having offices in London. Whether he thought these other Companies unworthy of notice, or that so much wisdom was known to be centred in the Chairman of the London and Birmingham Company, and his immediate satellites, that all the railway world besides would bow to their dicta, and follow them as bell-sheep, we have never been able to find out, but one fact is manifest, that whatever mischief happens hereafter to railway property is to be traceable to Lord Seymour's Bill as the unfortunate first cause, and, of course, to the parties who aided and promoted it.

Mr. Glyn, it is true, has now shown a disposition to oppose this last, or Mr. Labouchere's Bill. He says (see our last, p. 155), that himself and his colleagues do not feel that confidence in the present Bill which they had in the former, and that their confidence in that department of the Board of Trade devoted to railways is somewhat shaken; and, he adds, that any interference on the part of the legislature in the practical affairs of the Companies, or with those matters which fall so entirely within the province of the Directors, "would be by them met with a determined resistance." So far so good, but the mischief is, that there is now any necessity for this "determined resistance." Had Mr. Glyn and his coadjutors last year manifested more prudence and less vanity; had he, or they, not been so much overpowered by the compliment paid to them by the noble lord, and consulted the other Companies, or persons of sounder judgment than themselves, there would be no need for the present display of Quixotic valour.

The whole pith of this Bill, as one of our able correspondents very properly observes, lies in a few unostentatious words, or, rather, in words the import of which is cunningly endeavoured to be kept out of sight,

while others of no moment are paraded forth in all the pomp of superabundant verbiage.

We have already commented on the folly of one of the clauses—that of putting it in the power of the Board of Trade to postpone the opening of a railway indefinitely, by a month at a time—and have given proof of the incapacity of the would-be law-makers, in this respect, on the Great Western Railway. The slightest reflection would, indeed, inform us that if the engineer of the Company, who has watched day by day the progress of the works, cannot tell, the line being finished, if it is in a fit state to be opened, how is it possible a Government inspector can, totally ignorant, perhaps, of civil engineering, and who may never have seen the railway before! It is monstrous to suppose it. But the pretended apprehension is, that the Directors may force a premature opening for the sake of the returns. Here is a capital mistake. In the first place, it is the engineer—the man who is most intimately acquainted with the works—that decides, and also takes upon himself the responsibility when the line is to be opened, and his interest is not to open too soon. Secondly, it is well known that a line not properly consolidated is not merely dangerous but unusually expensive to work, and the Directors, therefore, know it to be their interest to put off the opening as long as they can, to avoid the double evil. An example we have now before us in the Great North of England, who have postponed the opening of their line for passengers for between two and three months, although it is completed from York to Darlington, and is now carrying enormous quantities of coal. But the influence of this discretionary clause, if allowed to pass, is of a still more pernicious character. If private pique or any other phantasy should seize the inspectors, they may, under one silly pretence or another, have it in their power to keep the public from having the benefit of the railway almost *ad libitum*. For instance, if the Company happen not to have finished all their stations, which is seldom the case when the line is first opened, and for long after, or some particular works, and are using their line for carrying materials, these inspectors may report that the line is unfit to be opened, and month after month the Shareholders may be deprived of their lawful income, and the public, for whose safety or convenience all this delay is hypocritically pretended to be, of the use and advantages of the railway. It is true that clause 12 provides for sending an account of their reasons for the delay before Parliament, but if Parliament is not sitting, the parties may have all the injuries of ignorance or pique in power inflicted upon them for months together, without a remedy. But suppose Parliament is sitting, and the reasons be immediately laid before it, and appear on the face of them unjustifiable, what can Parliament do to prevent the continuance of the tyranny? The power is in the hands of the Board of Trade, created and given to it by the Queen, Lords, and Commons united, and one House would not have the least influence over it, not half as much to put it down as we should. In truth, the reference to Parliament, as a curb upon the abuse of the power sought by this bill, is an insult to common sense, and we are astonished at the impudence with which it has been foisted on Mr. Labouchere.

The next subject worthy of attention is clause 10, the merits of which have been pretty well shown up by one of our correspondents in our last number. This is perhaps the most insidious and mischievous clause of all. The power it seeks is really awful, for it is in the strict sense of the word unlimited, and might be used to the ruin of any Company whatever. It requires that the Board of Trade may have power "to issue from time to time such regulations as they shall deem necessary for the prevention of accidents upon railways." "provided they do not propose anything experimental, nor interfere with the number, times of starting, or speed of the trains, except to preserve an interval of not more than fifteen minutes between succeeding trains." At first blush, this appears a very sober, quiet, reasonable clause, and no doubt so it was intended it should appear, but its composed, quiet aspect, like the cat's, is a covering to a most cunning and treacherous disposition. Under this clause the Board of Trade would have it in its power to drive every respectable man from being a Director to any railway, and to ruin it to the Proprietors, and of course to the public. What is there here to prevent the Board from ordering a Director to go with every train, or to perform the duties of a policeman on the line of road? It has only to give its order that it would be conducive to the public safety, which would be enough. What, again, is there to prevent, as one of our correspondents observes, the Board of Trade ordering the policemen to be multiplied indefinitely, or a man under the name of superintendent to go with each train at a salary which would swallow up the profits, and in some instances, the whole receipts of the train? What is there to prevent its commanding one or two pilot engines to precede each train, to see that the road is clear and safe, or a score or two of labourers with crow bars, axes, &c., to be taken with every train, to be ready to aid in case of accident? What is there to prevent its commanding additional sets of rails for the goods? There is nothing to prevent any one or all of these things from being ordered and done, or hundreds of other

crotchets, the whims of ignorance and folly; for all may be called "regulations they deem necessary for the prevention of accidents upon railways." It will be said these are improbable cases; granted, but they are possible cases, and such possibilities ought not to be allowed, nor the power of producing them placed in the hands of any branch of the executive, and more particularly in the hands of the three sages who signed the report. The moment the Companies permit such interference in their practical affairs, that moment they may consider, to use an Irishism, "the beginning of the end of their existence." We trust, therefore, that the Companies will unite heart and hand together to crush so artful an attempt to interfere with their management and trip up their independence and prosperity. If they do not, they will have once and for ever to repent it.

We hardly know whether it is worth our while to notice the silly plan of licensing enginemen. It is one of those absurd schemes that we fear will do more harm than good. The responsibility of the competence and steadiness of these men, and therefore the responsibility of their conduct, will, by this Bill, entirely rest with the Board of Trade, and be taken off the Directors, that is, off men who ought on no account, for the public's sake, to have one iota of their responsibility lessened. Prudence and common sense would tell us, that, if we want to have vigilant Directors, we ought to teach them more attention, by laying heavier responsibilities upon them. But this senseless Bill takes the very opposite course, and seeks to lighten their responsibility, and places to the account of the Board of Trade the decision of the fitness and competence of the enginemen. We do not object to this scheme at all, except upon the principle that we firmly believe it will relax the vigilance of the superintendents and Directors, and therefore work against the public.

From what we have here stated of this notable Bill, our readers will see that the axe is laid to the root of railway property, and, unless the companies are united, vigilant, and decisive, it will be for ever felled. They will see that this Bill is neither more nor less than an underhanded attempt, upon plausible grounds, to intermeddle with, and subvert, all the plans and proceedings of railway companies, founded on, and rapidly growing to maturity, by long and expensive experience—and for what?—for the sole purpose of finding situations and salaries to a few cunning grasping individuals, and enlarging the patronage of the minister. Railway travelling is admitted by Mr. Labouchere himself, Lord Stanley, Sir Robert Peel, and others, to be the safest mode of conveyance that exists, and the companies have been complimented by all for their great care, and disregard of expense in every thing conducive to the public comfort or safety. Mr. Labouchere has gone further, and distinctly proclaimed the superiority of the directorial over government management. He believes this: he acknowledges "that the government would be able to perform very inadequately, the railway directors can do much better." Wherefore, then, one would naturally ask, the reason for this intermeddling? If the companies have discharged their duty hitherto so well, and are constantly improving by their experience, as Lord Stanley has very truly observed, what good can come of this petty and vexatious interference? None, surely, and none the ministers expect, except in the way of patronage to themselves. But we trust, we repeat, that the companies will be firm and united; that they will show a bold front and a resolute determination to maintain intact that for which they have run so much risk and expended so much money, and fear not but the representatives of our country, to which they have done so much, and are still doing so much good, will stand by them. They must, however, be vigilant and active, and remember that their contest is now not to gain more, but to preserve that which they have.

Railway directors will see that now is the time for them to show their judgment and efficiency, in the discharge of their duty to their constituents. If they are backward or lax, whatever evils hereafter fall upon railways—whether they be of additional expense of management, or in vexatious intermeddling—they will be justly answerable for them. It will be in vain for the Directors to say that they did not see the mischievous operation of the bill, for we have bared a part—though not the largest part of it—to their eyes. No excuse, therefore, remains for them. They must either treasonably betray the trust reposed in them by their proprietors, or by a supineness, which is more criminal than open treason, because covered with the cloak of virtue, surrender their just, and what ought to be their sacred rights, in the fair and honest management of the property intrusted to their care. Let them, therefore, look to it. We have done our duty, let them see that they do theirs.—*Railway Magazine.*

[NOTE.—We quote the above article, though somewhat lengthy for quotation, not on account of its intrinsic merits, as containing much either of principle or of argument; but we believe that it embodies all that can be said of the most objectionable part of the railway bills, as originally passed, and against those most wholesome clauses, which take the sting out of the railway Acts, and give to the public that protection which

ought to have been possessed by them at the beginning. When the debate, such as it will be, comes on, we have no doubt that the points mentioned here will be those taken up by the stock-jobbing and other railway directors, who have seats in the House of Commons. They, however, are few in number, and feeble in talent and power; and though it is highly proper to hear them say their say, we do not think that they will make the slightest impression upon the well-informed and influential part of the House.

Some of the supposed degradations of directors, about which the writer puts himself in humours, are not a little ludicrous; and if they are introduced by the director-members in the House, they will be exquisitely so. What sets them all agape with horror is the thought that the Board of Trade shall order so mighty a man as a railway director to accompany a train on its trip, to see that every thing is properly done. Now admirals even, and captains go with their ships, and general officers with their divisions of the army, as part and parcel of their duty, and we know not why a railway director should be exempted from doing the same. We admit that the original plan and expectation of such directors, was to sit at home at their ease, and pocket money at the expense of the public; but they must have been far gone in the intoxication of their projects, or in natural dementia, if they thought the parliament would continue to them so unjust and monstrous a privilege. The bill will teach them another lesson, at the same time that it is as mild and gentle as such a bill could be made, and we hope to see it intact and perfect as the law of the land. We would have made it more stringent in the letter; but the powers which it will give to the Board of Trade are sufficient for all practical purposes.—COND.]

FIRES IN LONDON IN 1840,

ABSTRACTED FROM MR. BADDELEY'S COMPLETE AND VALUABLE REPORT IN THE MECHANICS' MAGAZINE.

ACCIDENTS by fire may naturally be expected to be numerous in so populous a place as London; but I suspect the aggregate number of the past year will astonish many of your readers, and is considerably greater than the majority of persons have any idea of.

I had occasion last year to observe that the number of London fires in 1839 was the largest that had occurred since the formation of the London Fire Establishment, and I have now to repeat that remark, as it applies with equal truth to 1840. It is true, that we have not upon this occasion to lament the destruction of any of our public edifices; a vast amount of property, however, has been consumed—many irretrievable losses have been sustained—and what is most distressing, several valuable lives have been sacrificed to the imperfections and incompleteness of our Police Establishments.

MONTHS.	Number of Fires.	Number of fatal Fires.	Number of Lives lost.	Alarms from Fires in Chimneys.	False Alarms.
January . .	60	3	3	9	8
February . .	80	3	3	11	4
March . . .	59	3	5	14	7
April . . .	55	1	1	13	8
May . . .	45	1	2	8	5
June . . .	62	2	6	6	3
July . . .	54	2	2	5	13
August . . .	68	2	2	6	8
September . .	54	1	2	4	4
October . . .	43	1	1	4	7
November . .	55	1	1	7	5
December . .	76	3	3	11	12
Total . . .	681	23	31	98	84

The number of fires wherein the premises were totally destroyed, is . . . 26
 Ditto ditto ditto seriously damaged . . . 204
 Ditto ditto ditto slightly damaged . . . 451
 Alarms which proved to be occasioned by chimneys on fire . . . 98
 False alarms, originating in error or design . . . 84

Making the total number of calls . . . 863

The number of instances in which Insurances had been effected on the building and contents	237
On the building only	62
On the contents only	104
Neither insured	248
	681

On reference to my last report (vol. xxxii., p. 376), where I gave an analytical table of London fires for the previous seven years, it will be seen, that the number of fires in 1840 has been greater than in any former year since the formation of the London Fire Establishment; being 97 more than in 1839, and 163 above the average of the last seven years. Although I have spoken of this as an increase, yet, if viewed statistically, I believe it would be found, that in relation to the increase of buildings and population, the same relative proportions as heretofore would be obtained.

The false alarms have borne the usual ratio to the fires, and mostly originated in deceptive appearances, unusual lights, escape of steam or of smoke, &c. Some groundless alarms of fire have originated in the reprehensible practice of burning waste rubbish between sun-set and sun-rise. The burning of old beds at Giltspur-street Compter, and at Bridewell, being conducted in the open air, before daylight, has frequently set the Fire Brigade in motion, and disturbed the neighbourhoods by creating needless alarms. It is to be hoped, that in future these operations will be conducted at some better chosen period of the day, when there will not be any appearances to cause confusion and alarm.

Of the *consumed*, the greater portion was composed of comparatively small and unimportant premises, and their total destruction has been occasioned by their trifling extent, their distant situation, or the entire absence of water.

Of the *seriously damaged*, each was attended with its several untoward peculiarities and difficulties, and surmounted only by the most undaunted bravery and consummate skill on the part of the comparatively small force brought in array against them. Nor are the *slightly damaged*, though less prominent in their details, and many of them altogether unknown, save in the immediate vicinity of their recurrence, less creditable to those concerned; exhibiting, as many of them do, the most extraordinary activity and indomitable perseverance, and *only retained* in this class by the exercise of untiring energy, frequently under the infliction of great physical suffering, without which many of the slight damages would inevitably have proved serious fires, and all the serious fires, total losses.

The following list exhibits the occupancy of the various premises in which the fires have originated, discriminating, as heretofore, between those which began in that portion of the building appertaining to the trade of the occupant, from those which have happened in, and been confined to, dwelling-houses only:

Apothecaries and dealers in drugs, but no chemical works carried on	5	Brought forward	134
Bagnios	2	Corn chandlers	3
Bakers	16	Curriers and leather sellers . .	1
Ditto, muffin	1	Drapers, linen and woollen . .	18
Basket-makers	1	Dyers	1
Beer shops	3	Eating houses	4
Booksellers, binders, and stationers	10	Farms	3
Brewers	1	Feather merchants	2
Brokers, and dealers in old clothes	5	Felt makers	2
Builders	1	Fire-work makers	1
Cabinet makers	14	Founders	1
Carpenters and workers in wood, not cabinet makers . .	38	Farriers and skin dyers	1
Chandlers	5	Grocers	12
Charcoal and coke dealers . .	2	Hat makers	8
Cheesemongers	2	Hotels and club-houses	4
Churches	3	Lamp-black makers	2
Cigar makers	3	Laundresses	1
Coach makers	2	Lodgings	68
Coffee and chop houses	4	Lucifer match makers	10
Coffee roasters	2	Manchester warehouses	5
Colour makers	3	Marine stores, dealers in . . .	3
Confectioners	6	Mast and block makers	1
Coopers	1	Mattress makers	1
Cork cutters	2	Millers	1
Ditto burners	2	Musical instrument makers . .	2
		Naptha manufacturers	1
		Oil and colourmen, not colour makers	10
		Painters, plumbers, and glaziers	1
Carried forward	134		301

Brought forward	301	Brought forward	598
Paper stainers	1	Sugar refiners	1
Pawnbrokers	3	Tailors	5
Playing-card makers	2	Tallow chandlers, wax chandlers, melters, and soap-makers	2
Potteries	1	Tanners	1
Printers and engravers	4	Tar distillers	3
Ditto, copper-plate	2	Tarpauling makers	1
Ditto, ink makers	4	Tinmen, braziers, and smiths .	4
Private dwellings	204	Tobacconists	3
Public buildings	3	Type founders	1
Rag merchants	6	Under repair and building . .	5
Railways	1	Unoccupied	3
Rope makers	4	Upholsterers	1
Sack makers	1	Varnish makers	2
Sale shops and offices containing no hazardous goods . .	29	Victuallers	35
Saw mills	2	Wadding makers	1
Ships	5	Warehouses	4
Ditto, steam	1	Weavers	3
Ship builders	1	Wine and spirit merchants . .	7
Soot merchants	3	Wood merchants	1
Stables	20		
Carried forward	598	Total	681

There has been occasioned by—

Accidents of various kinds, ascertained to have been for the most part unavoidable . .	23	Brought forward	453
Apparel ignited on the person (7 fatal)	12	Ditto, in repairing fittings . .	7
Candles, various accidents with	67	Illumination	1
Ditto, setting fire to bed-curtains (2 fatal)	53	Intoxication (1 fatal)	5
Ditto, window-curtains	49	Lamps, sparks from	3
Carelessness, palpable instances of	24	Lime, heating of	2
Children playing with fire and candles (3 fatal)	16	Linen, &c. airing before fires (1 fatal)	25
Ditto, lucifer matches	5	Lucifer matches, making of (1 fatal)	10
Fires, sparks from (2 fatal) . .	15	Ditto, using of	8
Ditto, kindled on hearths and in other improper places . .	7	Oven, defective, overheated, &c.	13
Fire heat, application of, to various purposes of manufacture and trade (1 fatal) . . .	31	Shavings, loose, ignited . . .	27
Firework making	1	Steam-engine, locomotive . . .	2
Flues, foul	53	Spontaneous ignition of coals	2
Ditto, blocked up	9	Spontaneous ignition of cotton waste	2
Ditto, overheated	27	Dung	2
Friction of machinery	3	Hay	1
Fumigation, incautious	3	Rags	3
Furnaces overheated, &c. . . .	15	Tan	1
Gas, sundry accidents from escape of	22	Stoves, overheated, &c.	15
Ditto, escaping from street mains	5	Drying	4
Ditto, accidents from carelessness in lighting of	13	Portable	11
		Pipe	13
		Hot air	5
		Suspicious	11
		Tobacco smoking	9
		Wilful	9
Carried forward	453		644
		Undiscovered (5 fatal)	39
			681

PREVENTION OF ACCIDENTS ON RAILWAYS.

WHenever any subject takes a strong hold on the mind of the British people, more especially if that subject has anything of fear, alarm, or apprehended danger in it, we have hundreds or thousands, each coming forward with his little panacea, which is to avert the evil and set all matters to rights. Even in the case of an out-of-the-way run of seasons which perplexes those soothsayers of the weather, who shake all its varieties upon tickets in a bag, and draw them out like a lottery, Murphys spring up like mushrooms; and when things come into their ordinary train, like mushrooms the seeds melt away. In cases of disease in man or beast, quacks and pretenders seem to be multiplied by the disease just as mag-

gots are in a sore. Nay, even in those blighting winds of public opinion, which are occasionally setting in, the wind appears to bring a multitude of destructive pretenders, just as the unkindest wind appears to bring lackey moths upon the apple trees, and aphides upon other plants, in multitudes which no man can number.

Railway accidents have for sometime taken hold of the public mind to an extent which is very unusual, and the alarm has been taken up and magnified by certain members of the public press until the credulous part, always a large part of the population, have come to the belief that railway trains partake more of the character of instruments of death than of anything else. To prevent the direful destruction of life and limb which these are supposed to be so prone to bring about, an incalculable number of headpieces are at work; so that it is impossible to glance at the contents of any of the ordinary journals without finding one or more projects for preventing accidents upon railways.

But, numerous and various as these are, and as are the grades of men and of minds with whom they originate, they all aim at one description of a cure. According to them, the whole evil seems to be of a mechanical nature, and to meet such, their proposed preventatives, at least what we have seen of them, are mechanical; and the object of a great number of them is to take off the concussion arising from the collision of one train with another, or of different parts of the same train, in case of accident to one singly. They consist of buffers, guards, springs, and various other contrivances, the very best of which would be of no more use in the collision of two trains than so many egg-shells and men; and even in a violent shock between the parts of a single train springs and buffers would be of no use, as is proved by the characters of the accidents themselves.

Every one who knows any thing about mechanics, must be aware that the resistances offered by all these appendages are nothing but simple pressures; and a pressure of this kind is nothing in the case of the collision of bodies having so much momentum as two railway trains at full speed. But why should the contrivers of those little matters that so inundate, and we may add annoy, the public, by keeping it in a state of restlessness and anxiety, presume that they know more about the mechanism and safety of railway trains, than the makers of the engines, and other parts of the train? These parties must understand their own business; and as their success in that business depends, in a great measure, upon the safety of the articles which they furnish, safety must be a first-rate consideration with them; and from their practice, if the buffers and other means of diminishing the effect of collision which they make, do not answer the purpose, it is not very likely that that purpose shall be better answered by one who merely thinks about locomotive trains, without knowing much, or perhaps any thing, about their general principles. In our opinion, and we believe all who rightly understand the subject will agree with it, the parts of a railway train are just as well adapted to each other as those of any compound machine can be, and no additional guards or defences affixed to any part of them would prevent or mitigate a single accident.

Thus far the projects of the contrivers of these small matters are an evil; for they give the credulous hopes of safety from things in which there can be none. But, in another respect, they are a far greater evil than this: they lead people to suppose that the causes of railway accidents lie in the wrong quarter. If the railway itself and the train are properly made, and the moving parts sound and good, they do not involve the danger, or almost the possibility, of a single accident; and it may with confidence be said that no means of transit, possessing even a third part of the velocity, was ever so safe.

Whence then arise the accidents which appal the public mind with such terrific features? They are one and all the faults of men, not of machines or apparatus of any kind. Trains come in collision because the timing of them is not duly attended to, or because the men in charge of the signals, or other means of giving notice, are negligent in their duty. It is true that the signals are rather a nice matter, and that, in the case of fogs especially, through which no light can penetrate to any distance, they require more study than has yet been bestowed upon them. But the grand evil is in the want of timing,—in sending one

train after the other too soon for being safe. The accidents which have happened to single trains, have invariably been owing to ignorance and negligence on the part of those in charge of the trains.

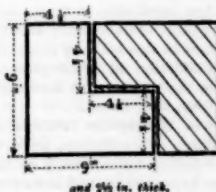
Though the circumstances would require further elucidation, they point out the Act of Parliament and the plenary powers of the Board of Trade, as the most efficient means of preventing railway accidents.

SCIENTIFIC SOCIETY OF LONDON.

THE monthly conversazione was held on Thursday, 18th instant, at which there was a numerous attendance,—George Alexander, Esq., V.P., in the chair. The attention of the meeting was occupied by a lecture by Mr. Charles Moxon, the Honorary Curator, in which he vindicated the consistency of geology with scriptural record,—and this he effected by the consideration of a series of questions, each affording an introduction to the other next succeeding. The meeting seemed much gratified with this, as with specimens of "Tissierography," which were exhibited by the patentees, "Messrs. Andelle & Co.," being a substitute for wood-engraving, and possessing, besides other recommendations, the great desideratum of a saving in cost of 50 per cent.

TO THE EDITOR.

SIR,



I THINK the new shaped bricks would prove very beneficial for building; especially thin walls. They would form a superior bond for a nine, fourteen, eighteen-inch, or thicker walls: they would not be more expensive than the bricks now in use; and the stability of the walls would exceed those now built.

The scored part of the diagram represents the plan of one of the new bricks.

If in your instructive journal you can spare a space for this, it will oblige,

Your obedient servant,
WILLIAM RHENRY.

February 20th, 1841.

SUBSTANCE OF THE REPORT OF THE OFFICERS OF THE RAILWAY DEPARTMENT.

TO THE RIGHT HONOURABLE THE PRESIDENT OF THE BOARD OF TRADE.

Presented to both Houses of Parliament by command of her Majesty.

In compliance with your instructions, that we should report to you upon the measures which our experience of the working of the railway system under the Act of last session for regulating railways, has suggested as necessary to give efficiency to the supervision of railways vested in the Board of Trade, we have the honour to report as follows:—

The objects which an effective supervision ought to embrace may be classed under three heads:—

1. Statistical. 2. Protection of public interests: 3. Providing for public safety.

A reference to the provisions of the Act for Regulating Railways, 3 & 4 Vic., c. 97, and to the reports of the select committee on railways, upon which that measure was founded, shows that the attention of the committee and of the legislature was chiefly directed towards the first and second of these objects, and that the third, which experience has since proved to be the most important, was, comparatively speaking, overlooked.

With regard to the first two points, the principles upon which a Government supervision of railways ought to be based were fully considered by

the select committee, upon the authority of whose reports we may consider it as established:—

1. That Railway Companies using locomotive power possess a practical monopoly for the conveyance of passengers on their several lines of railway, and that under existing circumstances this monopoly is inseparable from the nature of these establishments, and from the conduct of their business with due regard to the safety of the public.

2. That this monopoly is the result of circumstances contemplated neither by the legislature nor by the Companies themselves, the extensive powers contained in their Acts of Incorporation having been obtained under the impression that the interests of the public were sufficiently secured by fixing a maximum rate of tolls, and providing for free competition in the locomotive power and other means of conveyance.

3. That, under these circumstances, the legislature is bound to provide that the public interests shall not suffer from the mistaken view taken in the infancy of the science of locomotion, and that for this purpose the powerful monopolies, in whose hands a large and increasing portion of the internal communication of the country is placed, should be subjected to the supervision and control of the Board of Trade.

4. That, as an important part of this duty, the Board of Trade should collect and register statistical information on all points of general interest connected with the railway system.

5. That, with a view to the protection of the public against any abuse of their irresponsible powers on the part of these monopolies, the Board of Trade should have the power of ascertaining precisely what the system is which is enforced towards the public on every railway, and of disallowing any part of it which appears obviously arbitrary or objectionable; and also of enforcing the observance of all provisions beneficial to the public contained in Railway Acts.

These points being fully established after mature inquiry by the reports of the committee on railways, it will be sufficient for us, with reference to this branch of the subject, to show in what respects the Act of last session fails of accomplishing the objects recommended by the committee, and what additional enactments appear necessary in order to give them effect.

With reference to the other branch of the subject, viz., providing for the public safety, little evidence was gone into before the committee, and in their report they expressly state that they postpone the expression of any opinion on the subject from the belief that more satisfactory information would be obtained by the Board of Trade. This information has been obtained more speedily than the committee could have anticipated, in consequence of the rapid succession of alarming accidents which have occurred since the date of their inquiry.

The steps taken by the railway department of the Board of Trade in requiring returns of all accidents upon railways, and instituting inquiries into those which, from their nature and magnitude, seem calculated to throw light upon points of general importance, have placed us in possession of a number of facts with regard to the causes of danger upon railways, and the means of providing for the public safety, the result of which we now proceed to state, as the ground upon which we recommend an application to Parliament for additional powers, with a view to the protection of the public.

[Here follows a list of railway accidents, with the lines upon which they have happened; but it is of no value for statistical purposes, inasmuch as the number of persons carried is not given; and therefore the ratio of casualty cannot be compared with that by other means of conveyance. This ought not to have been the case in a Report which was to be the foundation of legislative proceedings on so very important a subject. The particulars of some of the most striking accidents are given; but it does not appear that these are of much value. The details recommended, as for future management, are also of a crude and unsatisfactory nature; and some of them, such as that "an engine-driver should be able to read his instructions"—are perfectly ludicrous; and remind one of Drummond of Hawthornden's instructions for choosing Scotch members of parliament, one of which was, that "nae man suld represent any burgh or shire who couldnt open his mouth before he spoke." We shall reserve our future remarks until the bill now before parliament is licked into shape by the second reading.]

This list is confined to accidents of a public nature, and excludes the numerous cases of accidents which have occurred to servants of the Company under circumstances not involving danger to the passengers or public, and also of accidents which are attributable to carelessness or misconduct on the part of the person injured. It is exclusive also of accidents unattended with personal injury, respecting which we have no power of calling for returns. The term "defective arrangement" has been used in

stating the cause of the accident, not as necessarily implying neglect on the part of the Company, but simply as stating the fact, that the accident is one which under an improved system of arrangements might have been prevented.

The following results appear from this list:—

1st. Out of 35 railway accidents which have occurred in the course of five months, 21 are attributable, among other causes, to "defective arrangements."

2nd. Eighteen are attributable to "misconduct of servants;" and

3rd. Six are attributable to mechanical causes, among which the breaking of axles occupies a prominent place.

With reference to these results, the following observations suggest themselves:—

1. The inherent danger of railway travelling is very small, and even under the present system less than that of other modes of conveyance.

2. It is not, however, by reference to *comparative*, but to *absolute* safety that the question must be considered. The public have a right to expect that the *maximum* degree of safety which the nature of the case admits should be attained without reference to the safety of other modes of travelling. This is the more necessary, as railway accidents, when they do occur, are frequently of a frightful character, and calculated to cause a panic in the public mind, which materially diminishes the benefit which the country would otherwise derive from this improved mode of conveyance.

3. The maximum degree of safety is far from being attained in practice, as appear from the fact that a great majority of the accidents above referred to have arisen from causes not in any respect inherent to the nature of locomotive travelling, and which might have been avoided by the adoption of a better system of arrangement.

[The following remarks come as near to "absolute wisdom," that is, to wisdom in the "ablative absolute," or not followed by a verb or "working" word, as any thing we have seen.]

For instance, there can be no doubt:—

1st. That an engine-driver should be able to read his instructions, and should fully understand them.

2nd. That he should have a competent experience and practical knowledge of the ordinary duties necessary for the management of an engine.

3rd. That he should know what course to adopt in any of the emergencies which can be foreseen as likely to arise in the course of his employment.

4th. That he should be able to produce an unimpeachable character for sobriety, steadiness, attention to orders, and general good conduct.

These may be looked upon as conditions which the public has a right to expect, and which ought to be introduced generally at the earliest possible period; at the same time, however, it must be borne in mind that great discretion will be necessary in the first instance, especially with regard to engine-drivers already in the employment of Railway Companies.

With regard to the details of the system of licence and examination we should recommend:—

1st. That it should commence at a period of three months from the passing of the Act, and apply to all engine-drivers employed in the course of the public traffic.

2nd. That all candidates for licences should be brought forward by Railway Companies.

3rd. That the examination should be conducted by not less than two persons nominated by the Board of Trade, one of whom, as a general rule, should be the engineer of the Company by whom the candidates are brought forward; the final decision of each case resting with the Board of Trade.

4th. That the licence should be kept by the Company by whom the engine-driver is employed, and a badge given with the licence to be worn conspicuously.

5th. That the Board of Trade should keep a register of licences, and have power to cancel or suspend licences.

6th. That if an engine-driver leaves his situation, or is dismissed, notice should be given by the Company to the Board of Trade, and the Company should be bound to keep the licence and badge until instructed by the Board of Trade whether to cancel, suspend, or give them up to the engine-driver.

7th. In cases of emergency the Board of Trade should have the power of dispensing with the penalty for employing unlicensed persons as engine-men.

SUBMARINE PROPELLERS AND PADDLE WHEELS.

WHETHER the Archimedes screw produces under ordinary circumstances an acceleration of speed or not we consider of very secondary importance; we have no doubt but it does, and to an extent which will eventually appear very conspicuously; and we think the clear and able explanation on this point, in the letter of Mr. Roger Phillips, of Whitehaven, published in the *Mechanic's Magazine* for October, is conclusive; but the travelling public will regard this only as one of the minor merits of the screw-propeller. We are of opinion that a steamer, even on the old construction, is safer at sea, in all weathers, than an ordinary sailing vessel of the same size and trim, as long as the engines and paddle-wheels continue in perfect order, and there are plenty of coals to keep them going; but when any circumstance occurs to stop the machinery, and render it useless, we have no hesitation in stating that the common steam vessel becomes the most helpless log that floats upon the waters; and the situation of the crew and passengers is from that moment critical and dangerous. We put it to the captains of sea-going steamers themselves, whether, under such circumstances, they could ever gain one point to windward? and, whether, in the event of a gale of wind, the utmost efforts of human ingenuity could get the vessel out of the trough of the sea, if she once broached to, which she would probably do almost immediately? It is notorious, that the *Erin* was lost from this circumstance. This unfortunate steamer was passed by several vessels in the course of the day, lying in the trough of the sea (as it is nautically termed), and was reported off Milford, distance about 20 miles, with signal of distress flying, the wind blowing at the time a gale at north-west; she must, therefore, some hours before she went down, have been within sight of land, with a fair wind, of which no use could be made.

When the *Killarney* also was disabled, she was some miles to windward of Cork harbour, and drifted all across its mouth, with a fair wind to run in. Even the loss of the *William Huskisson*, last winter, (certainly that of the remaining passengers), may in a great measure be attributed to her complete helplessness, when the rolling of the water from the leak put the fires out; as she was several hours in distress before Captain Clegg, with the *Huddersfield*, came to her assistance: whereas, between Liverpool and Dublin, a fast sailing vessel, with a stiff breeze, is never above four or five hours' run from a safe harbour, let the wind be which way it will.

It was the knowledge of the fact, that the great shocks to which the ordinary machinery is subjected in a heavy sea, are very liable to put the engines out of order, and the great danger to which the vessel would then be exposed, which prevented for 20 years any attempt to establish a regular steam communication with America; and even now, although in such a castle at sea as the *Great Western*, with such enormous power, and so amply provided with remedies for almost every kind of accident to which she is exposed, one might not feel very apprehensive, as long as the provisions continued abundant; yet we question whether, in the event of her engines becoming effectually damaged, the renowned Hosken himself would not be very willing to exchange the commandership of this "mighty monarch of the deep" for that of a snug little schooner, of no more than 100 tons burden, even in the midst of the "broad Atlantic."

Now, with respect to the *Archimedes* (or any good vessel similarly appointed), not only is she safer than an ordinary sailing vessel, while her machinery continues effective—and much less likely to have this put out of order than it would be on the old plan, because the strain on it is always nearly equal—but she is also, to all intents and purposes, and in all situations, even with her machinery stopped and rendered useless, quite as safe as any sailing vessel would be. With her propeller detached from the engine (which can be done in one minute), it has been ascertained that she is as well able to "turn to windward" as a fast-sailing yacht; and "when her gaff-foresail came down by the run," says Captain Scott in his letter to Captain Chappell—(vide Report, p. 53)—"she stayed against a heavy sea, which proves her to be a very handy vessel."

We confess that, to us, this advantage appears immense; it makes all this difference: that, whereas the safety of vessel and passengers, in the former case, depends generally altogether on the machinery, in the new plan, on the contrary, the machinery is merely an additional means of speed, which, like a studding-sail, can be set or taken in at pleasure, and which may, and does, add considerably to the safety of the vessel, but can never, under any circumstances, materially diminish it; and, had this method been applied in the first instance, there would have been no more risk in sending steamers of ordinary size and power to America, twenty years ago, than there is now in navigating them to France or to Ireland.

When we have been exposed to a heavy cross sea, even in steamers of known and approved good qualities, and great power, we could not hear, without some degree of nervousness, the thundering shocks which the engines had constantly to sustain, while, perhaps within a mile to leeward,

the sea has been going bodily over the bold rocks of an iron-bound coast, from which nothing could have saved us had our machinery given way; but, in a similar situation, in the *Archimedes*, no anxiety need be felt; the engine would perform its duty with the same steadiness and regularity as before, or, if stopped, the vessel would be perfectly competent to continue her course with scarcely diminished velocity, (wind abeam,) under a press of canvass alone.

It may occur to some of our readers that, as other steamers carry sails also, surely they could manage to keep off the land as well as the *Archimedes* in the case of damaged machinery; but they will understand us better when we tell them, that under the circumstances just detailed, the *Archimedes*, supposing her to be able to carry all sail, would go probably nine miles an hour; (Captain Chappell states, that in going from Southampton to Portsmouth, her speed, under sails alone, never was reduced below eight knots, close upon a wind;) while we may venture to state that no steamers now navigating the Bristol Channel would be able, in such a case, with the additional drag of her paddle-wheels and boxes, to go above three miles in the same time, which being insufficient to counteract her lee-way, she would in all probability drift ashore in less than an hour.

As we have considered this point of distinction, the most interesting to society at large, we have dwelt more upon it than we originally intended, and will now describe more briefly the advantages in point of convenience which the screw-propeller possesses over the side-paddle-wheels. The first of these is, in our opinion, the ready obedience of the vessel to her helm in turning. Every one who is accustomed to travel by steamers, must have been repeatedly annoyed by the tediousness of getting the vessel into her berth or landing-place; even in wide rivers, affording considerable room, the running a-head and backing-astern are often continued for nearly half-an-hour, before the shivering and impatient passenger can put his foot on terra firma. Now, it seems the *Archimedes* will make a complete round turn in two minutes and a half, and in a circle whose diameter is about twice her own length—a most material consideration; and when we remember the many fatal accidents which have happened, by steamers running into each other, even when one party has seen and hailed the other in its approach (as in the case of the *Britannia* and the *Phenix*, so lately), her great superiority in this respect is evidently more than a convenience. Paddle-wheel steamers obey their helms readily enough for ordinary purposes, and the vessel's head may be easily veered a point or two in either direction; but they are incapable of performing a rapid manœuvre. Probably one of our Irish packets, when running with the full power of her steam, would not accomplish a circle much within the circumference of a mile: it is impossible to say how much this circumstance may have contributed to the losses of the *Water Witch*, and the *City of Bristol*. The error in both cases was discovered before the vessels struck, and the helm shifted, but not sufficiently soon to enable them to escape the danger.

The next ground of preference of the *Archimedes* is, her having no external paddle-wheels to agitate the water, or to impede the crowded traffic of our rivers.

The great number of accidents, attended with loss of life, which have happened on the Thames, from the paddles of steam-vessels, either coming into actual contact with wharves and river-craft, or causing an overpowering swell in the immediate vicinity of deeply laden boats, render it somewhat singular, that the London authorities generally, and the Humane Society in particular, have not hitherto made any public demonstration in favour of a plan which obviates all the evils of the old system.

A steamer on the *Archimedes* plan, is neither of greater breadth than a sailing vessel of similar tonnage, nor does she cause a greater swell: and she is so much the safer in threading her way among boats and vessels, from her ready obedience to the helm in either direction: and if it be ascertained, that the business of steam-navigation can be done, without the necessity of constant danger to the lives of boatmen and their passengers, in our rivers, it behoves those whose duty it is to provide for the public safety, to take measures for establishing it on such a footing. We should be sorry to see enterprise disconcerted, or "vested interests" molested; but the humblest individual in society has a claim, paramount to either, on the consideration of the magistrate. Immediate interference would, perhaps, be premature and unjust; but the public would not be unreasonable in expecting, that from and after a date to be fixed on, no steamer should be allowed to approach within four or five miles of London-bridge, under the action of side-paddle-wheels; and a similar regulation, adapted to local circumstances, will, we doubt not, eventually obtain at all other steam-packet stations. The great caution exercised in our own river (frequently attended with no little delay), renders accident here of more rare occurrence; but, commercially speaking, we are in still greater need of a substitute for wide-spreading paddle-wheels, on account of the narrowness of our river, and the entrance to our docks. That our *Great Western Steam Company*, therefore, should be among the earliest to appreciate Mr. Smith's plan, on

a magnificent scale, will surprise no one who is aware of what they had previously accomplished; and we cordially congratulate them on their spirited determination to be the first to surpass themselves. The same wisdom and sagacity which has already enabled them to obtain the confidence of the public, has, we doubt not, led to the deliberate adoption of this noble invention; and their boldly resolving to apply it to a steam vessel of 3000 tons burden, does equal honour to themselves and to the inventor. It is no experiment; but a triumph of public spirit and laudable emulation over preconceived notions of excellence and perfectibility—and, as such, we doubt not the public will receive and appreciate it.—*Bristol Magazine*.

MISCELLANEOUS.

SOUTHAMPTON DOCK COMPANY.—The Directors of this Company state in their report that, in consequence of the prospective increase of traffic, they have found it necessary to enlarge the plan, and they say that even with these two additions, the Tidal Dock will be by far the cheapest dock in the kingdom, whilst its attractiveness will be unsurpassed. The dredging of the Itchen has been contracted for, and is now proceeding in the hands of a responsible contractor with due activity. The Directors congratulate the Proprietary on all litigation as to calls having ceased, and on the prospect of being able to raise money this year by loan.

NORTHERN AND EASTERN RAILWAY.—The Directors in their report, at the late meeting, express their satisfaction with the result of the opening of the line, and of the prospects of traffic. It appears that they have made arrangements for laying a double line to Broxbourne, and also for opening to Harlow-road, seven miles further, in July.

NORTH UNION RAILWAY.—The report at the late half-yearly meeting congratulates the Proprietors on the steady and rapidly progressive increase of the receipts in all the different branches of the undertaking, the receipts from the passenger and parcel traffic having increased over those of the corresponding period of the former year £3,339 2s. 5d., the total increase being £4,614 12s. 3d. The report anticipates an increase of traffic, alluding particularly to the intercourse with the rising town of Fleetwood. The dividend declared is £2 10s. per share, or at the rate of £6 13s. 4d. per annum. It is further added, that since the opening of the line, above 400,000 passengers have been carried without an accident of any importance having occurred to any passenger.

SHEFFIELD AND MANCHESTER RAILWAY.—At the late half-yearly meeting of the Sheffield and Manchester Railway Company at the Albion Hotel, Manchester, the Directors gave a most gratifying account of the progress of the works, which it seems are proceeding with great vigour. The traffic, it seems, on the line has been retaken, and found considerably to exceed the former estimate. Whatever the traffic may be, we have always thought that from the very peculiar gradients on this line, the expense of working it, if judiciously managed, will be very little greater than on a level.

COAL PITS.—In March, 1836, seven men commenced sinking two coal pits at Wood-park, between Ashton-under-Line and Oldham, belonging to Messrs. Leeds and Co., and on Thursday week they completed their work. The depth of one shaft is 378 yards 6 inches, and the other, 365 yards 2 feet 6 inches. Six out of the seven men have worked the whole time in sinking. They have cut through ten beds of coal, and one of canal; and when at the depth of 180 yards, they stopped upwards of 3,000 gallons of water per hour, without lessening the diameters of the pits, which are ten feet each for the whole depth. The men have had the good fortune to finish their work without a single accident. On Monday week the proprietors of the colliery gave the sinkers a very handsome present.—*Cambridge*.

WHEATSTONE'S ELECTRO-MAGNETIC INDICATOR.—We have seen at Mr. Dent's Chronometer manufactory, 82, Strand, Mr. Wheatstone's electric clock for railway purposes. It is a most ingenious instrument. The object of it is, by means of an electro-magnetic communication with a standard clock placed at any distance—whether at 1 or 500 miles—to make the indicator give simultaneous beats and show the same time, or a time with any constant difference. The beats of the standard and indicator were so perfect, that they appeared to us to be one and the same. With Mr. Dent's detached pendulum the application is most easy and effective, and without any extra wheel to the clock. The manner in which this apparatus is applied to the clocks, so that the movements of the hands of both may be perfectly simultaneous, is the following. On the axis which carries the scape-wheel of the primary clock a small disc of brass is fixed, which is first divided on its circumference into sixty equal parts; each alternate division is then cut out and filled with a piece of wood, so that the circumference consists of thirty

regular alternations of wood and metal. An extremely light brass spring which is screwed to a block of ivory or hard wood, and which has no connection with the metallic parts of the clock, rests by its free end on the circumference of the disc. A copper wire is fastened to the fixed end of the spring, and proceeds to one end of the wire of the electro-magnet; while another wire attached to the clock-frame is continued until it joins the other end of that of the same electro-magnet. A constant voltaic battery, consisting of a few elements of very small dimensions, is interposed in any part of the circuit. By this arrangement the circuit is periodically made and broken, in consequence of the spring resting for one second on a metal division, and the next second on a wooden division. The circuit may be extended to any length; and any number of electro-magnetic instruments may be thus brought into sympathetic action with the standard clock. It is only necessary to observe that the force of the battery and the proportion between the resistances of the electro-magnetic coils and those of the other parts of the circuit, must, in order to produce the maximum effect with the least expenditure of power, be varied to suit each particular case.—*Railway Magazine*.

THE LETTER BOX.

We are aware that, in the present instance, several letters have escaped our notice. Some of these are mislaid, and probably lost, so that if the writers please they will have the kindness to write again.

A COASTER complains of the damage done to the shipping, by ice, in the Thames, during the late severe frost, and inquires why the authorities have not ice-breakers and ice-docks prepared against such occasions. We know not for what reason the conservators of the Thames either do, or neglect, many other matters besides this; neither are we prepared to say what breakers or docks would be required to reduce the ice, and prevent the serious disasters that are produced by it. We know that there are ice-breakers in many of the American rivers, and that they appear to do their business well and safely, but we know of none in a river circumstanced like the Thames. The subject is, however, one worthy of consideration.

NO MONOPOLIST says, that an engine placed in the rear of a train, to assist the engine in front, has no tendency to propel the carriages against each other in the case of a stoppage in the fore part of a train. If this be true, what is the use of the engine in the rear? We grant, that if its working were stopped and its breaks put down, it would not propel, but help to hold on; but then the accident and its effects happen before this can be done.

Out of another part of this correspondent's short letter, there arises a problem, for a solution of which we should feel very much obliged to him, and we have no doubt that many others would join in the feeling:—Supposing a railway train to be going onward at the rate of twenty-five miles an hour, and that a man of ordinary weight and strength leaped from the door of one of the advanced carriages; how far from the rails would he impinge on the railway, and in what direction would his body tumble, after he touched the ground? It must be understood, that before a man were so excited as to take this desperate leap, his muscular power would be paralyzed, and thereby diminished certainly more than one third, which would bring him more nearly to a perpendicular fall than if he were in full possession of all his energy. This problem is a little complicated, but still it admits of a solution, and our correspondent would do himself some credit by sending one.

IGNORAMUS, like most of those who assume such appellations, seems modestly to use his nom de guerre as a bushel to hide the candle of his acumen. Under such circumstances, the best way to bring him out and make him shine, would be for himself to give a full syncretical account of the kind of survey which he enunciates, together with a clear and perfect analysis of all the steps by which the results are obtained.

A CHESHIRE MAN.—We are pleased at the receipt of his letter, because it shows that the mere random hints which we threw out respecting Liverpool have excited some attention. What we said about the tendency not to form banks, was founded entirely upon the physical character, without any reference to the effects produced by Docks projecting into

the river, or any other works of human construction. But, according to "A Cheshire Man," the range and position of the docks, and the fact of discharging the silt far out in the tide-way, when the docks are cleansed, have tended to injure the Cheshire shore of the Mersey, originally the best and safest for navigation, according to him; and the throwing of the upper tide against the Cheshire shore produces an eddy on that shore farther down, whence there is a tendency to the formation of a bank, that may in time impede the entrance. The letter is not, however, circumstantial enough for publication at length, and it involves questions which would require a clear statement of the evidence on both sides.

We close this Article, in the mean time, with a recommendation to our correspondents to oblige us with their communications as early as possible, otherwise we cannot make sure of giving them due attention.

LIST OF PATENTS.

Continued from page 25.

(SIX MONTHS FOR ENROLMENT.)

Charles Schaffhœutl, of Swansea, Doctor of Medicine, Edward Oliver Manby, of Parliament Street, civil engineer, and John Manby of the same place, civil engineer, for "improvements in the construction of puddling, balling, and other sorts of reverberatory furnaces, for the purpose of enabling anthracite, stone coal, or culm, to be used therein as fuel."—Sealed January 30.

James Mac Lellan, of the city of Glasgow, manufacturer, for "an improved combination of materials for umbrella and parasol cloth."—Sealed January 30.

Ezra Jenks Coates, of Bread Street, Cheapside, merchant, for "improvements in the forging of bolts, spikes, and nails," being a communication.—Sealed January 30.

Henry Pape, of Great Portland Street, piano-forte manufacturer, for "improvements in castors."—Sealed February 1.

Charles Hood, of Earl Street, Blackfriars, iron merchant, for "improvements in giving signals."—Sealed February 1.

William Wilkinson, tailor, of Barrowfield House, Westham, Essex, Gent., for "improvements in buffing apparatus for railway purposes."—Sealed February 1.

Dominic Frick Albert, of Cadishead, Manchester, LL.D, for "an improved or new combination of materials and processes in the manufacture of fuel."—Sealed February 1.

Francis Heddon, Jun., of Preston, machine maker, for "certain improvements in machinery or apparatus for roving, slubbing, and spinning cotton and other fibrous substances."—Sealed February 2.

William Ward Andrews, of Wolverhampton, ironmonger, for "certain improved methods of raising and lowering windows and window blinds, and opening and shutting doors, which are also applicable to the raising and lowering of maps, curtains, and other articles."—Sealed February 2.

Thomas Young, of Queen Street, London, merchant, for "improvements in furnaces or fire places for the better consuming of fuel."—Sealed February 3.

William Hancock, Jun., of King Square, Middlesex, accountant, for "an improved description of fabric suitable for making friction gloves, horse brushes, and other articles requiring rough surfaces."—Sealed February 3.

Joshua Bunnnett, of Deptford, engineer, for "certain improvements in locomotive engines and carriages."—Sealed February 3.

John Cartwright, of Loughborough, manufacturer, Henry Warner, of the same place, manufacturer, and Joseph Heywood, of the same place, frame smith, for "improvements upon machinery commonly called stocking frames, or frame work knitting machinery."—Sealed February 4.

Thomas Griffiths, of Birmingham, tin plate worker, for "certain improvements in such dish covers as are made with iron covered with tin."—Sealed February 8.

James Thorburn, of Manchester, machinist, for certain improvements in machinery for producing knitted fabrics."—Sealed February 8.

William Ryder, of Bolton, roller and spindle maker, for "certain improved apparatus for forging, drawing, moulding, or forming spindles, rollers, bolts, and various other like articles in metal."—Sealed February 8.

Thomas Fuller, of Salford, machine maker, for "certain improvements in machinery or apparatus for combing or preparing wool, or other fibrous substances," being partly a communication.—Sealed February 8.

Elisha Oldham, of Criclade, Wilts, railroad contractor, for "certain improvements in the construction of turning-tables, to be used on railways."—Sealed February 8.

Charles Green, of Birmingham, gold-plater, for "improvements in the manufacture of brass and copper tubes."—Sealed February 8.

William Wigston, of Salford, engineer, for "a new apparatus for the purpose of conveying signals or telegraphic communications."—Sealed February 8.

Joseph Scott, of Great Bowden, Market Harbo', timber merchant, for "improvements in constructing railways, and in propelling carriages thereon, which improvements are applicable to raising and lowering weights."—Sealed February 8.

James Johnston, of Willow Park, Greenock, esq., for "improvements in obtaining motive power."—Sealed February 8.

William Henry Fox Talbot, of Locock Abbey, Wilts, esq., for "improvements in obtaining pictures or representations of objects."—Sealed February 8.

William Edward Newton, of Chancery Lane, Middlesex, mechanical draftsman, for "improvements in obtaining a concentrated extract of hops, which the inventor denominates 'Humuline,' being a communication."—Sealed February 15.

Theophilus Smith, of Attleborough, Norfolk, farmer, for "certain improvements in ploughs."—Sealed February 15.

James Whitelaw and George Whitelaw, engineers, of Glasgow, for "a new mode of propelling vessels through the water, with certain improvements on the steam engine, when used in connection therewith, part of which improvements are applicable to other purposes."—Sealed February 15.

Philip William Phillips, of Clarence Place, Bristol, gent., and William Bishop Peck, of Broad Street, Bristol, wine merchant, for "improvements in four-wheeled carriages."—Sealed February 15.

James Ransome and Charles May, of Ipswich, machine makers, for "improvements in the manufacture of railway chairs, railway and other pins or bolts, and in wood fastenings and trenails."—Sealed February 15.

William Scamp, of Charlton Terrace, Woolwich, surveyor, for "an application of machinery to steam vessels for the removal of sand, and soil, and other matters from the sea, rivers, docks, harbours, and other bodies of water."—Sealed February 16.

William Samuel Henson, of Allen Street, Lambeth, engineer, for "certain improvements in steam engines."—Sealed February 16.

George Edward Noone, of Hampstead, engineer, for "improvements in dry gas-meters."—Sealed February 18.

William Orme, of Stour Bridge, iron master, for "improvements in the manufacture of cofered spades, and other cofered tools."—Sealed February 18.

John Collard Drake, of Elm Tree Road, St. John's Wood, land surveyor, for "improvements in scales used in drawing and laying down plans."—Sealed February 18.

Anthony Bernhard Von Rathen, of Kingston-upon-Hull, engineer, for "certain improvements in fire-grates, and in parts connected therewith, for furnaces for heating fluids."—Sealed February 18.

William Newton, of Chancery Lane, Middlesex, civil engineer, for "improvements in the process of, and apparatus for purifying and disinfesting greasy and oily substances, or matters both animal and vegetable," being a communication.—Sealed February 22.

Thomas William Booker, of Melin, Griffith's works, near Cardiff, iron-master, for "improvements in the manufacture of iron."—Sealed February 22.

Jonathan Guy Dashwood, of Ryde, Isle of Wight, plumber, for "improvements in pumps."—Sealed February 22.

Moses Poole, of Lincoln's Inn, Middlesex, gent., for "improvements in tanning, dressing, or currying skins," being a communication.—Sealed February 22.

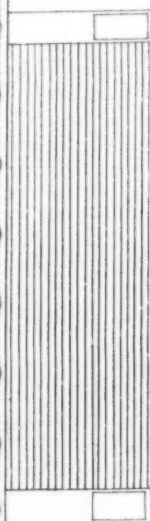
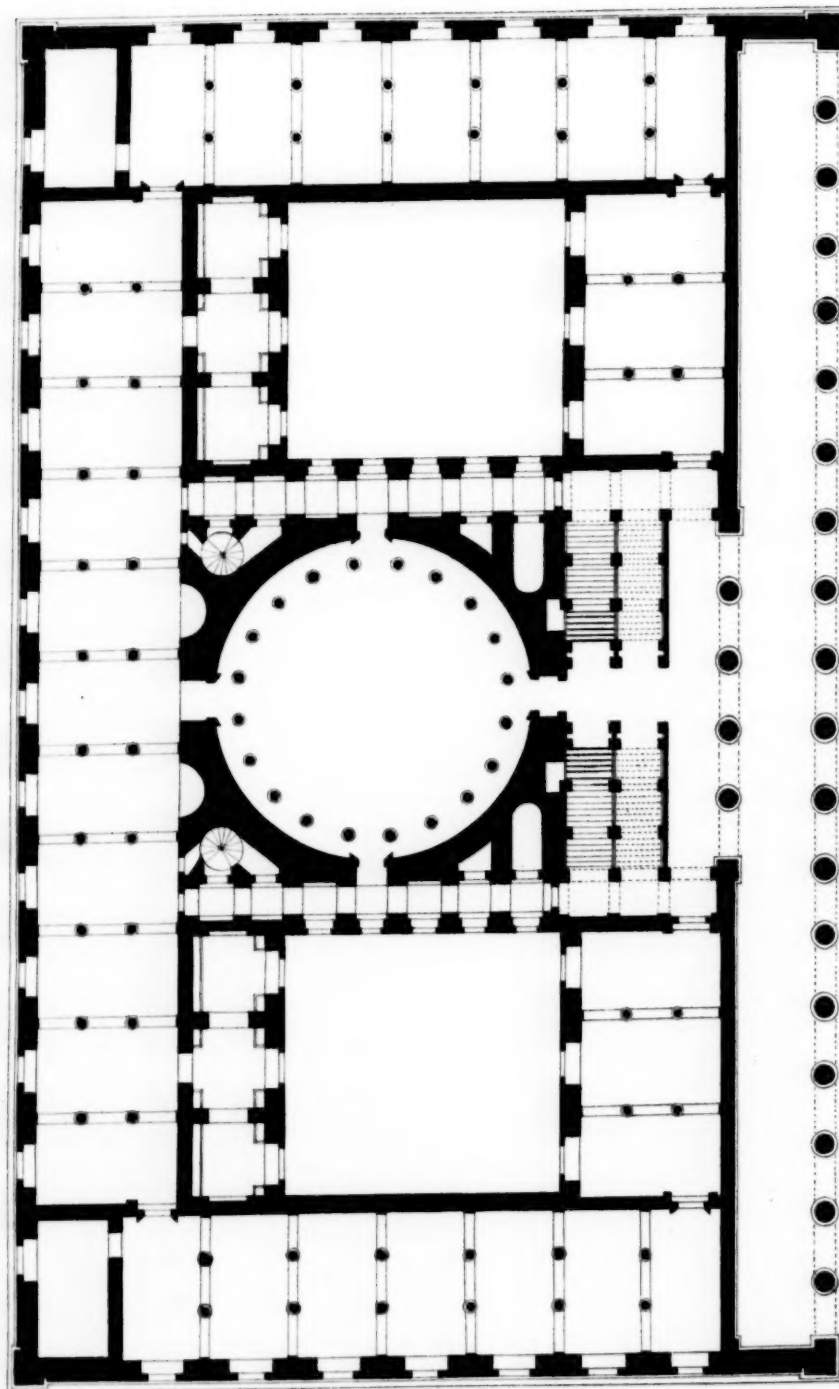
John Dean, of Dover, chemist, for "improvements in preparing skins and other animal substances, for obtaining gelatine size and glue, and in preparing skins for tanning."—Sealed February 22.

Charles Sneath, of Nottingham, lace manufacturer, for "certain improvements in machinery for the making or manufacturing of stockings, or other kind of loop-work."—Sealed February 22.



GROUND PLAN OF THE MUSEUM AT BERLIN.

SCHINKEL ARCHITECT.



10 20 30 40 50 60 70 80 90 100 110 120 Feet.

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